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In the Supreme Court of the United States

OCTOBER TERM, 1977

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS, PETITIONER

v.

DALE R. FLOOK

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

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The Solicitor General, on behalf of the Acting Commissioner of Patents and Trademarks, petitions for a writ of certiorari to review the judgment of the United States Court of Customs and Patent Appeals in this case.

OPINIONS BELOW

The opinion of the Court of Customs and Patent Appeals (App. A, *infra*, pp. 1a-5a) is reported at 559 F.2d 21. The initial opinion and opinion on request for reconsideration of the Patent and Trademark Office Board of Appeals (Apps. B and C, *infra*, pp. 6a-10a and 11a-13a, respectively) are not reported.

JURISDICTION

The decision of the Court of Customs and Patent Appeals was rendered on August 4, 1977. The jurisdiction of this Court is invoked under 28 U.S.C. 1256. *Gottschalk* v. *Benson*, 409 U.S. 63; *Dann* v. *Johnston*, 425 U.S. 219.

QUESTION PRESENTED

Whether a method is patentable subject matter under 35 U.S.C. 101 when the sole inventive contribution consists of a mathematical algorithm to be conventionally implemented, preferably in a standard general-purpose digital computer, and applied to control existing manufacturing processes.

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

Article I, Section 8, clause 8, of the Constitution of the United States provides:

> The Congress shall have Power * * *
>
> * * * * *
>
> To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries * * *.

35 U.S.C. 101 provides:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

STATEMENT

Respondent, an employee of Atlantic Richfield Company, applied (R. 6)[1] for a patent on a "Method for Updating Alarm Limits" on manufacturing conditions that are monitored in the catalytic conversion of hydrocarbons.[2] The method consists of periodically carrying out a mathematical algorithm to recalculate permissible outer-limit values (termed "alarm limits") of one or more of the physical conditions or physical variables (such as temperature) that are pertinent to such chemical processes, and then readjusting those alarm limits to conform to the recalculated values.

To safely and efficiently carry out commercial chemical-manufacturing processes, like the catalytic hydrocarbon-conversion processes to which respondent's claimed invention relates, controlled conditions are required. For each process, various "process variables" (such changeable conditions as heat, pressure, and reactant and product flow rate) must be maintained within a specified range. Control systems employed to monitor and regulate such process variables typically include general-purpose digital-computer equip-

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[1] "R." refers to the printed record filed in the Court of Customs and Patent Appeals. A copy of this record has been lodged with the Clerk of this Court.

[2] Such hydrocarbon conversion processes commonly occur in industries such as petroleum refining and petrochemical processing. See, *e.g.*, R. 7. Apparently, hydrocracking of petroleum distillates into gasoline is the most important application that respondent envisions. See R. 15-18, 88-89 (claims 7, 8, 10).

ment, and are capable of periodically measuring the values of the various process variables, comparing these values to their specified outer permissible limits, and alerting a system operator (usually through the sounding of an alarm) to take corrective action whenever the values of any of the process variables fall above or below those permissible limits (which are therefore called "alarm limits") (R. 8).

Respondent's claimed invention relates to the means of calculating the alarm-limit values. In previous control systems, either the alarm-limit values were fixed at the optimum range for the duration of the whole process, or, if the alarm-limit values were expected to change from time to time as the process continued, the alarm limits had to be periodically adjusted manually (R. 8-9). Respondent's algorithm, however, provides a method of periodically recomputing and "updating" these alarm-limit values to adjust for changing operating situations (R. 8-9). It updates the alarm-limit value for a process variable by calculating a weighted sum of the present value of the process variable and a function of its previously-measured values,[3] and then adding to this sum a pre-

[3] In respondent's Example 1 (R. 18-20), the weighted sum is 60% of the present temperature and 40% of the "alarm base" function of the previously-measured temperatures. The relative weighting is decided upon after the user experiments to find optimum ratios (R. 11-12). The "alarm base" function is described at note 5, *infra*, p. 5. The function is similar to an average, but one in which recent measurements are given more weight than earlier measurements. An example of such a function is ½ the present value, plus ¼ the previous value, plus ⅛ the value before that, plus 1/16 the value before that, and so on.

determined "alarm offset" value.[4] The final sum of these numbers is the updated alarm-limit value for the process variable.[5]

[4] This is a constant. It is what the user empirically determines is the maximum acceptable variation from the process variable's desired operating value (R. 11-12). In respondent's Example 1 (R. 18-20), the alarm offset value is 9° F.

[5] The mathematical algorithm used to calculate the updated alarm-limit values is set forth in claim 1, steps 2 and 3, of the patent application, and explained and illustrated in the specification (R. 10-11, 18-23). In essence, respondent's claimed method consists of using the following equations to arrive at an updated alarm-limit value ("UAV") (see R. 18-19):

(1) $B_0 = CAV - K$,

where CAV is the current value of the alarm limit, K is the empirically-determined alarm offset constant, and B_0 is the "alarm base" (a function of initial and subsequent values of the process variable);

(2) $B_1 = (B_0)\ (1 - F) + (PVL)\ (F)$,

where PVL is the present value of the process variable, F is an empirically-determined constant or weight factor greater than 0 and less than 1, B_0 is the prior value of the "alarm base" (from the previous equation), and B_1 is the recalculated value of the "alarm base"; and

(3) $UAV = B_1 + K$,

where UAV is the updated value of the alarm limit, and K and B_1 are from equations (1) and (2).

As each successive updated value (UAV) is determined, it is substituted for the last alarm-limit value (CAV) in order to determine whether to sound the alarm (see R. 20).

Respondent's claims do not specify the particular values of K and F that establish the precise mathematical relationships

Respondent claimed the general method (however implemented) for updating alarm-limit values on chemical hydrocarbon-conversion process variables by using this algorithm (see claim 1), the method as implemented automatically (see claims 3-6, 9, and 10), and the method as implemented electronically for hydrocracking petroleum distillates (as in gasoline production) (see claim 10). R. 87-89.[6] Some claims for the method (see claims 1, 2, 7, 8; R. 87-88) may be performed manually, with " 'pencil and paper' calculations" (see R. 38), but the preferred embodiment of the method that the application describes is by electronic (*e.g.*, digital-computing) means (R. 13). In this embodiment, a conventional general-purpose digital computer that can be used to monitor a process (and generate a signal to set off an alarm when necessary) is programmed to perform respondent's algo-

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involved in the equations. Rather, the system operator "plugs in" values for these constants on the basis of his past experience with the process in question; respondent states that the appropriate values of K and F can be arrived at by "routine experimentation" (R. 12).

[6] The claims all depend on claim 1, but vary in different ways from it and one another by reason of added greater specificity. Thus, claim 9 further specifies that the automatic operation of the method be accomplished "using electronic means." It is clear from both the specification (*e.g.*, R. 13) and the papers respondent filed in the prosecution of his patent application before the Office (*e.g.*, R. 33, 60) that such "electronic means" include a conventional general-purpose digital computer, although the claims do not so limit the means. Other claims contain limitations as to use in monitoring transient phenomena or in hydrocracking. Claim 1 is the most sweeping and claim 10 is the narrowest and most specific.

rithm, so that updated alarm-limit values are calculated according to steps 2 and 3 of respondent's claim 1 (R. 60-61).

It is not disputed that aside from the novel algorithm for computing updated alarm-limit values every aspect of respondent's claimed invention is conventional and well-known in the art.[6a] The patent examiner found that "the only difference between [respondent's] claims and the prior art is in the mathematical formula involved in updating the value of an alarm limit" (R. 28, 38; see R. 68-70). The computer programming of this mathematical formula for use in conventional electronic equipment is, respondent states, "well within the ordinary skill of the art" (R. 60-61). Finally, as the examiner noted, such automation produced "no unexpected results" (R. 70). The patent examiner rejected all of respondent's claims (R. 87-89) as unpatentable under 35 U.S.C.

[6a] Respondent stated that the chemical processes involved in catalytic conversion of hydrocarbons are "well-known," as are the operating conditions and catalyst compositions employed (R. 14, 15). He also stated that chemical process control systems already exist in which automatic equipment monitors the process variables and sets off an alarm if the acceptable limits on the variables are exceeded (R. 13-14, 32-35). The system operator can, and does, recompute and readjust these limits manually (R. 8-9); the determination of the limits is made according to well-known principles regarding the normal behavior of the process (R. 11-12). Apparatus that can automatically carry out respondent's method—"automatic equipment involving a digital computer which can be used for automatic process monitoring-alarming" (R. 61)—is "conventional and well-known" (R. 14, 32-35, 45-49, 60-65).

101 (R. 38),[7] and stated that a patent on the claimed method "would in practical effect be a patent on the formula or mathematics itself" (R. 68).

On appeal, the Board of Appeals of the Patent and Trademark Office (the "Board") sustained the rejection. Because respondent "proposes to use conventional automatic alarm adjusting equipment" to implement his claimed invention, the Board concluded, any inventive contribution that he made is only in "the formulas or algorithm [that he] disclosed and claimed" (App. B, *infra*, p. 9a; R. 77), and thus is unpatentable under the decision in *Gottschalk* v. *Benson*, 409 U.S. 63. Respondent requested reconsideration of the Board's decision, arguing that his claims were unlike Benson's and did not cover a mathematical algorithm, because the final recited step of his method (step 4 of claim 1) was not the solution of a mathematical equation, but rather the application of such a solution (made in the preceding steps) to a method of regulating a chemical process (R. 79-83). The Board rejected this attempted distinction as "specious" and re-affirmed its initial decision (App. C, *infra*, pp. 11a-13a; R. 83-85).

The Court of Customs and Patent Appeals reversed, finding that respondent's claims "do not preempt the formula or algorithm contained therein, because solu-

[7] Initially, the examiner had also rejected respondent's claims to his method as implemented automatically (claims 3-6, 9, and 10) as insufficiently disclosed (35 U.S.C. 112). The examiner later withdrew this rejection (R. 66), however, and it was thus not in issue before the Board of Appeals or the court below.

tion of the algorithm, per se, would not infringe the claims" (App. A, *infra*, p. 5a).[8] According to the court below, the holding in *Benson*, *supra*, was a narrow proscription on patentability that is limited to situations in which the claims wholly pre-empt a mathematical formula or algorithm. The court therefore held that *Benson* did not govern this case, because the instant claims include a recitation that "materially limits [them] to a scope less than the mere act of solving an algorithm" (*id.* at 4a-5a).

REASONS FOR GRANTING THE WRIT

The decision of the court below conflicts both with the rationale of *Gottschalk* v. *Benson*, 409 U.S. 63, and with the well-recognized principle that ideas and mental concepts, however claimed and however useful, are not patentable. It is the latest in a series of rulings by that court[9] that rests on a strained interpreta-

[8] The basis for this finding is that claim 1 (upon which all of the other claims depend, directly or indirectly) covers not only the carrying out of the mathematical algorithm to perform a calculation, but also (in step 4) the use of the number so calculated as an updated alarm-limit value of a process variable (see R. 87-88). Solution of respondent's equations, without the added step (step 4) of utilizing the answer, would therefore not infringe claim 1.

[9] *Application of Johnston*, 502 F.2d 765 (C.C.P.A.), reversed on other grounds *sub nom. Dann* v. *Johnston*, 425 U.S. 219; *Application of Noll*, 545 F.2d 141 (C.C.P.A.), certiorari denied *sub nom. Dann* v. *Noll*, No. 76-1558, October 3, 1977 (application abandoned); *Application of Chatfield*, 545 F.2d 152 (C.C.P.A.), certiorari denied *sub nom. Dann* v. *Chatfield*, No. 76-1559, October 3, 1977 (petition out of time); *Application of Deutsch*, 553 F.2d 689 (C.C.P.A.).

tion of *Benson*, and that has created serious uncertainty, confusion, and unwarranted delay in the administration of the patent laws.[10] To await infringement litigation to test the validity of this patent (and other such patents on methods that in essence consist of algorithms to be performed by computers) would prolong the period of such uncertainty, at unnecessary cost to industry, the public, and the Patent and Trademark Office.[11] Moreover, if the decision is allowed to stand, substantial numbers of (in our view, invalid) patents for such methods will issue.[12] The Acting Commissioner of Patents and Trademarks believes that this would result in an added burden of time-consuming and expensive patent litigation in the courts and would also have a debilitating effect on development of the computer industry[13] and on all

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[10] In dissent in *Chatfield, supra*, Judge Rich recognized an "urgent need to settle the question of patent protection for software by higher authority than this court so that the Patent and Trademark Office, the Federal judiciary as a whole, and the data-processing industry (hardware and software both) may know what the law on software patentability is" (545 F.2d at 161). He continued: "It is a socioeconomic issue with an impact of considerable magnitude, particularly on the practical operation of the Patent and Trademark Office" (*ibid.*).

[11] Cf. *Graham* v. *John Deere Co.*, 383 U.S. 1, 18 ("To await litigation is—for all practical purposes—to debilitate the patent system.").

[12] The Patent and Trademark Office estimates that approximately 600 to 900 applications for computer programming patents are now pending, and that approximately 450 such applications are now filed each year.

[13] The 1972 receipts volume for computer programming and other software services, defined as "establishments primarily

areas of the economy (of which chemical processing is only one example) in which computer technology can be applied.[14]

The question presented in this petition is whether the presently-claimed method (in which the sole inventive contribution is a mathematical algorithm to be conventionally implemented, preferably by computer programming) is distinguishable from the method at issue in *Gottschalk* v. *Benson, supra* (which was a mathematical algorithm to be conventionally implemented by computer programming), in some way that

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engaged in providing services in-computer programming, systems design and analysis, and other computer 'software'" (*Standard Industrial Classification Manual* (1972)), was almost $1 billion, out of a total data-processing services volume of $3.4 billion. United States Department of Commerce, *U.S. Service Industries in World Markets: Current Problems and Future Policy Development* A-96 (December 1976). This nearly $1 billion figure is exclusive of the software services that integrated electronic computer manufacturers provide in conjunction with their computer systems. Compare *Standard Industrial Codes* 3573 ("Electronic Computing Equipment") and 7372 ("Computer Programming and Other Software Services") (1972). With an estimated industry compound growth rate of between 15 percent and 20 percent per year, the 1975 dollar volume for the software services industry was more than $1.5 billion. *U.S. Service Industries in World Markets, supra*, at A-90, A-96.

[14] One example of such a debilitating effect is that in order to avoid the "often staggering" expenses of defending a patent suit (see *Picard* v. *United Aircraft Corp.*, 128 F.2d 632, 641 (C.A. 2) (concurring opinion of Frank, J.)) businessmen may pay tribute to specious patents of this type on the ground that royalty payments are a lesser evil than litigation expenses. See generally *Blonder-Tongue Laboratories, Inc.* v. *University of Illinois Foundation*, 402 U.S. 313, 334-336.

makes it patentable. We submit that, like Benson's, respondent's implementation of his algorithm is not the "invention" or "discovery" of patentable subject matter under 35 U.S.C. 101 and the pertinent case law.

1. In reversing the Office's rejection of respondent's claims, the court below purported to distinguish *Benson* solely on the ground that respondent's claims cover not only the performance of a mathematical algorithm to solve equations, but also the use of the numbers so calculated to update "alarm limits," which in turn can be used in monitoring variables involved in a chemical process. Therefore, "solution of the algorithm, per se, would not infringe the claims" (App. A, *infra*, p. 5a), because each of the claims literally covers both (1) the algorithm used to calculate alarm-limit values and (2) the adjustment of the alarm limits to reflect the newly calculated values (see step 4 of claim 1; R. 88). The court below therefore held that the claims do not *wholly* pre-empt the formula, and consequently are patentable (App. A, *infra*, p. 5a).

But such a distinction is, as the Board below held, "specious" (App. C, *infra*, p. 12a; R. 84). Respondent's recitation of a last step that applies the result of a previously-claimed mathematical calculation adds nothing that makes the algorithm a patentable invention. It is as if respondent were trying to patent the Pythagorean Theorem as part of a method, by adding a final step that suggested applying the solution of the equation to surveying. Such a last step is not an integral part of a new invention, but rather the non-

inventive application of a mathematical result to existing technology;[15] that fact is not changed by the facile device of so drafting a claim that it places an abstract mathematical algorithm within a recitation of steps performing conventional, existing technology. Regardless of the patent draftsman's selection of form, the claimed invention itself must satisfy the statutory and judicial standards for patentable subject matter, including those applied in *Benson*. The claimed invention here does not do so.

2. The patent statute (35 U.S.C. 101)[16] permits a patent to be issued only to one who "invents or discovers" subject matter that comes within one of four concrete statutory classes: machines, articles of manufacture, compositions of matter, and processes (or methods) for making or using one of the foregoing.[17]

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[15] It is undisputed that the use of calculated alarm-limit values to control chemical process variables is old in the art. See note 6a, *supra*, p. 7.

[16] The particular language involved here is quite old, dating from the Patent Act of 1790, Section 1, 1 Stat. 109:

> That upon the petition of any person or persons * * * that he, she, or they, hath or have invented or discovered any useful art, manufacture, engine, machine, or device, or any improvement therein * * * it shall and may be lawfull to * * * cause letters patent to be made out * * *.

The term "process" was substituted for "art" in the 1952 Code. See 35 U.S.C. 100(b) ("process" means "art" or "method").

[17] Respondent's claims fall solely within the last of the four enumerated classes (processes or methods). Respondent claims a new method of updating alarm limits on process variables involved in hydrocarbon conversion, rather than a new machine or article of manufacture, or a new use of an old machine, article of manufacture, or process, etc.

It might appear from this language that any development that could possibly be characterized as a method of doing anything would be statutory subject matter. Nevertheless, as the examiner correctly recognized (R. 67), certain types of developments (for example, an idea or abstraction, even if it is an important advance in human thought) have never been considered to be the "invention or discovery" of patentable subject matter.[18] This long-standing exclusion from statutory patent coverage is grounded in the policy expressed in the Patent Clause of the Constitution (Article I, Section 8), which authorizes the grant of limited patent monopolies to inventors for their discoveries, but only to "promote the Progress of Science and useful Arts." [19] Issuance of patents on abstract ideas (however novel) would, on balance, impede that progress more than promote it, because granting such monopolies would deny the public the benefit of "the basic tools of scientific and technological work." [20]

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[18] The principle against patent grants on ideas is not limited to abstract intellectual concepts; it applies as well to scientific principles, phenomena of nature, mental processes, and mathematical formulae or algorithms like that held unpatentable in *Benson*. See *infra*, pp. 14-19. See, *e.g.*, *Benson*, *supra* (mathematical algorithms); *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (phenomenon of nature); *Rubber-Tip Pencil Co.* v. *Howard*, 20 Wall. 498, 507 (mechanical principle); *O'Reilly* v. *Morse* (the *Telegraph* case), 15 How. 62 (scientific principle). Similarly, methods of doing business are unpatentable. *Joseph E. Seagram & Sons, Inc.* v. *Marzall*, 180 F.2d 26, 28 (C.A.D.C.); *Hotel Security Checking Co.* v. *Lorraine Co.*, 160 Fed. 467, 469 (C.A. 2).

[19] See *Graham* v. *John Deere Co.*, 383 U.S. 1, 5.

[20] *Benson*, *supra*, 409 U.S. at 67.

3. It is undisputed that the only novel contribution in what respondent claims as an invention lies in the particular algorithm or equations used to compute "alarm limits" for process variables: both the computation of alarm limits to be used to regulate such process variables, and the equipment used in connection with the computation, are old in the art. It may be assumed that respondent's use of these particular mathematical equations for chemical-processing purposes is novel and reflects an inventive contribution.[21] Nevertheless, the setting of this idea (itself unpatentable) does not meet the requirements for patentable subject matter under 35 U.S.C. 101.

First, as the Court found in *Benson*, *supra*, in reviewing "the requirements of our prior precedents" on the patentability of methods (409 U.S. at 68-71), patents for processes applying scientific principles or ideas have been upheld only when: (1) the process was carried out with a specific apparatus devised to implement the newly-discovered idea, and (2) the claim to a monopoly was confined to a specific end-use or field of art or technology. Because the claims in *Benson* were not limited to a particular novel apparatus and to a particular end-use or technology, this Court held that they amounted to claims to the

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[21] The Board did not reject respondent's algorithm as obvious over the prior art within the meaning of 35 U.S.C. 103, or as lacking novelty and utility within the meaning of 35 U.S.C. 101-102. It held, in effect, that respondent did not "invent[] or discover[] any * * * process [or] machine * * * or any * * * improvement thereof" on which a patent may lawfully be granted under Section 101 and the pertinent case law.

algorithm itself, and thus were unpatentable under 35 U.S.C. 101.[22]

By the same token, in *O'Reilly* v. *Morse* (the *Telegraph* case), 15 How. 62, the Court allowed Morse's claim for a process of using electromagnetism in a specified novel apparatus to produce signals for telegraphic use. But it denied a claim for the general method of communicating by means of electromagnetism, because that would impermissibly extend Morse's patent monopoly to cover a whole scientific principle, regardless of the apparatus utilized to carry out the method and scientific principle. Similarly, in *The Telephone Cases*, 126 U.S. 1, the Court allowed Bell's method claim for telephonic use of electric current, only because it was limited to the method as carried out with the "magneto and variable resistance" mouthpiece devices that Bell developed. See *Benson*, *supra*, 409 U.S. at 68-69.

Although the claims for the present method may be limited to the particular end-use, art, or technology of catalytic conversion of hydrocarbons, and therefore satisfy the second branch of the criterion just described (*supra*, p. 15), the claims are not limited to any novel apparatus (such as Morse's telegraph apparatus or Bell's mouthpiece apparatus) devised to carry out the new method. Instead, as respondent

[22] In *Benson* the Court also considered another class of methods, not pertinent here, in which temperature ranges and other physical limitations on claims for transformations of substances supplied the necessary specificity "to confine the patent monopoly within rather definite bounds" (409 U.S. at 69).

expressly admitted (*e.g.*, R. 60-65), the mathematical algorithm can be, and indeed is designed to be, "carried out in existing computers long in use" for monitoring and regulating chemical processes (cf. *Benson*, *supra*, 409 U.S. at 67).[23] Consequently, respondent's claims do not satisfy the first branch of the first criterion of patentability for such methods (*supra*, p. 15):

The presence or absence of the limitations found lacking in *Benson* is not the only test, however. This Court has also construed the statute to require that the patent applicant's means of implementing the idea, in the form of a new method (or machine or product), must extend beyond the routine, conventional, or uninventive applications of the idea that follow once the applicant possesses the idea. Thus in *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127, the patentee had "discovered" the law of nature that particular strains of bacteria used to

[23] Indeed, some of respondent's claims are so broad that they need not be performed by electronic digital-computer means; rather, they can be performed manually (as the examiner found, R. 38), or on a hand-held pocket calculator. Anyone using the mathematical concepts of respondent's algorithm to calculate alarm-limit values for these chemical process variables (and then using the numbers for "updating") would infringe respondent's claim 1, regardless of the means by which the calculation is made. Moreover, claim 1 is not even a method of making or using a machine, article of manufacture, or composition of matter. It is simply a method of calculating a number (termed an "alarm limit"). Similar objections apply to at least claims 2, 7, and 8. Methods of calculating numbers, regardless of what the numbers are then used for, are not patentable. *Gottschalk* v. *Benson*, *supra*.

inoculate certain plants did not have an inhibitory effect on one another, and had applied this "discovery" by preparing a new mixture of bacteria culture. Despite the fact that this new mixture was a concrete product to be employed for a specific end-use in a specific art or technology, the Court held that it nevertheless "fell short of invention within the meaning of the patent statutes" (*id.* at 131). The reason, as the Court explained, was that there was nothing inventive in preparing the mixture to carry out the discovery, once the scientific discovery (unpatentable in itself) was grasped—"however ingenious the discovery * * * may have been, the application of it is hardly more than an advance in the packaging of the inoculants" (*ibid.*).[24] Thus, regardless of the inventiveness of the scientific principle, its application must also be in-

[24] In *Benson, supra,* 409 U.S. at 67-68, the Court held that the principle of *Funk* applies to "process" or "method" claims (like those at issue in both *Benson* and the case at bar) as well as to claims for "products."

See, to the same effect as *Funk, Armour Pharmaceutical Co.* v. *Richardson-Merrell, Inc.*, 396 F.2d 70, 73-74 (C.A. 3); *National Lead Co.* v. *Western Lead Products Co.*, 324 F.2d 539, 542 (C.A. 9); *Davison Chemical Corp.* v. *Joliet Chemicals, Inc.*, 179 F.2d 793, 794-795 (C.A. 7), certiorari denied, 340 U.S. 816; *Loew's Drive-In Theatres, Inc.* v. *Park-In Theatres, Inc.*, 174 F.2d 547, 551-552 (C.A. 1), certiorari denied, 338 U.S. 822. In each of these cases the courts held that no patent should have been granted, because there was no invention in devising the claimed embodiment once the patentee had possession of the idea (which was unpatentable as such). See also *Rubber-Tip Pencil Co.* v. *Howard*, 20 Wall. 498, 507 (once patentee had idea of attaching eraser head to pencil, device to give idea effect involved nothing "new").

ventive for the method or product to qualify as patentable subject matter.[25]

The same principle applies here. The present respondent claims a method for updating alarm-limit values for process variables. The only novelty in respondent's method is in the mathematical formula by which these values are calculated. But once respondent worked out the equations or algorithm for computing the alarm-limit values, each aspect of the implementation of this algorithm was entirely straightforward and conventional,[26] just as the aggregation of certain bacteria in *Funk, supra,* was a straightforward and conventional implementation of the scientific principle involved in that case.

Accordingly, the Court of Customs and Patent Appeals erred in mandating patent protection for re-

[25] As in cases involving claimed combinations of old elements, the scientific principle and its application would have had to co-operate or co-act with one another in such a way that "the whole in some way exceed[ed] the sum of its parts" (*Great Atlantic & Pacific Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147, 152), or that the "old parts or elements * * * perform[ed] or produce[d] [a] new or different function or operation than * * * theretofore" (*Lincoln Engineering Co.* v. *Stewart-Warner Corp.*, 303 U.S. 545, 549). See also *Reckendorfer* v. *Faber*, 92 U.S. 347, 356-358; *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.*, 396 U.S. 57, 61; *Deepsouth Packing Co.* v. *Laitram Corp.*, 406 U.S. 518, 521-522; *Sakraida* v. *Ag Pro, Inc.*, 425 U.S. 273, 282.

[26] See note 6a, *supra,* p. 7. Indeed, as the patent examiner stated: (1) respondent's application of his idea contained "nothing new over the prior art [except] the formula or mathematics" (R. 69-70); and (2) respondent's implementation of the idea by use of automatic computer equipment produced "no unexpected results" (R. 70).

spondent's ordinary, noninventive application of an abstract idea. Respondent's method involves neither a claim of a newly-devised apparatus nor an inventive manner of implementing the idea. Respondent's mathematical algorithm is therefore not raised above the unpatentable status of an idea to the patentable status of an "invent[ion] * * * [of a] new and useful process" under 35 U.S.C. 101. Any change in this standard, which derives from well-settled judicial interpretation of the patent statute which has existed substantially in the same form since its first enactment in 1790,[27] must come from Congress. See *Benson*, *supra*, 409 U.S. at 72, 73.

CONCLUSION

For the foregoing reasons, the petition for a writ of certiorari should be granted.

Respectfully submitted.

WADE H. MCCREE, JR.,
Solicitor General.

JOHN H. SHENEFIELD,
Assistant Attorney General.

RICHARD H. STERN,
DONNA R. LENHOFF,
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JOSEPH F. NAKAMURA,
Solicitor,

JERE W. SEARS,
Deputy Solicitor,
United States Patent and Trademark Office.

NOVEMBER 1977.

[27] See note 16, *supra*, p. 13.

APPENDIX A

UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

Patent Appeal No. 77-512

Serial No. 194,032

IN THE MATTER OF THE APPLICATION OF DALE R. FLOOK

Decided: August 4, 1977

BALDWIN, Judge.

This is an appeal from a decision of the Patent and Trademark Office (PTO) Board of Appeals (board) sustaining the rejection of claims 1 through 10 of appellant's application for "Method for Updating Alarm Limits" [1] as nonstatutory subject matter under 35 USC 101. We reverse.

The Invention

The invention relates to a process for controlling at least one parameter of a catalytic hydrocarbon conversion process. An alarm results when the actual value (PVL) of the parameter reaches an alarm value. The alarm value is not fixed but rather is peri-

[1] Serial No. 194,032, filed October 29, 1971.

odically adjusted as a function of the history of the actual value of the parameter. This adjustment is accomplished by some type of computer in accordance with a mathematical control equation. In essence, the process involves an initial step which reads the parameters of the chemical process system, an intermediate step which uses an algorithm to calculate a desired new value for the alarm value, and a final step in which the actual alarm value is adjusted. Claim 1 is the only independent claim.

> 1. A method for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons wherein said alarm limit has a current value of
>
> $$Bo + K$$
>
> wherein Bo is the current alarm base and K is a predetermined alarm offset which comprises:
>
> (1) Determining the present value of said process variable, said present value being defined as PVL:
>
> (2) determining a new alarm base B_1, using the following equation:
>
> $$B_1 = Bo\ (1.0\text{-}F) + PVL\ (F)$$
>
> where F is a predetermined number greater than zero and less than 1.0;
>
> (3) determining an updated alarm limit value which is defined as
>
> $$B_1 + K$$; and, thereafter
>
> (4) adjusting said alarm limit to said updated alarm limit value.

The Rejection

The examiner stated that, while the claimed invention is clearly a method useful within the technological arts, the only part of this claimed invention which is not conventional is the particular algorithm used to adjust the alarm value. The examiner interpreted *In re Christensen*, 478 F.2d 1392, 178 USPQ 35 (CCPA 1973), as holding that such claims are not statutory subject matter under 35 USC 100-101, notwithstanding the fact that they are within the technological arts.[2]

The board adopted the examiner's view of *Christensen* and the rejection based on that view. On rehearing, the board expressly rejected appellant's position regarding the holding in *Christensen*. Appellant's position is that express language in *Christensen* limited the holding in that case to claims in which the solution of the novel equation is the *last step* of a claimed process.[3] This condition is, of course, not

---

[2] The examiner made a second argument which, to the extent that it is relevant to the § 101 rejection, appears to state that inventions which replace human judgment with mathematical formulas are nonstatutory. The board did not discuss this argument and neither the appellant nor the solicitor briefed it. We will, therefore, not consider it.

[3] Both appellant and the PTO relied on the following passage in *Christensen* to support their contrary positions.

> The issue before us in the instant case is also a narrow one, namely, is a method claim in which the point of novelty is a mathematical equation to be solved as the final step of the method, a statutory method? We follow the Supreme Court in concluding that the answer is in

present in appellant's claims. The board held that appellant's focus on the "last step" condition is misplaced because whether or not there happens to be a step after solution of the algorithm is a mere matter of form.

OPINION

The issue in this case is whether a claim to a process which *uses* an algorithm to modify a conventional manufacturing system is statutory subject matter under *Gottschalk* v. *Benson*, 409 U.S. 63, 175 USPQ 673 (1972) and *Christensen*, supra. We hold that the invention here claimed is statutory subject matter.

Christensen's holding of nonstatutory subject matter is expressly limited to claims directed to determining data used in an algorithm and solving the algorithm, that is, to claims in which nothing is done after solution of the algorithm. *Christensen* recognized that the *absence* of a step other than those steps required for solution of the algorithm necessarily precludes the possibility that the claim involves statutory subject matter. The court, in *Christensen*, reasoned that *Benson* requires that a claim must include a recitation which materially limits the claim to a scope less than the mere act of solving an al-

---

the negative. Given that the method of solving a mathematical equation may not be the subject of patent protection, it follows that the addition of the old and necessary antecedent steps of establishing values for the variables in the equation cannot convert the unpatentable method to patentable subject matter. [478 F.2d at 1394, 178 USPQ at 37-38.]

gorithm. The court determined that this requirement of a limitative recitation is not satisfied by the recitation of data-gathering steps but implied that it may be satisfied by the recitation of some sort of post-solution activity. Because the court found no post-solution activity recited in the claims of *Christensen*, the court did not need to reach the question of what sort of post-solution activity is required for statutory subject matter. Thus, *Christensen* does not render the claims before us unpatentable, because these claims include recitation of post-solution activity, a step in which the solution is applied to a control system.

We must then consider whether *Benson* itself excludes the present claims from patentability. *Benson's* proscription was limited by its words to claims which involve a "mathematical formula" and which "would wholly pre-empt the mathematical formula." 409 U.S. at 72, 175 USPQ at 676. The present claims do not preempt the formula or algorithm contained therein, because solution of the algorithm, per se, would not infringe the claims.[4] Thus, *Benson's* holding does not render the claims before us unpatentable. The decision of the board is *reversed.*

REVERSED

---

[4] See *In re Deutsch*, 553 F.2d 689, 193 USPQ 645 (CCPA 1977) and *In re Chatfield*, 545 F.2d 152, 191 USPQ 730 (CCPA 1976), In which this court held there to be statutory subject matter in claims for the *use* of algorithms to control manufacturing facilities and computers, respectively.

APPENDIX B

OPINION AND DECISION OF BOARD OF APPEALS MAY 19, 1976

Paper No. 18

Before Burns and Spencer, Examiners-in-Chief, and Lindquist, Acting Examiner-in-Chief.

Burns, Examiner-in-Chief.

This is an appeal from the final rejection of claims 1-10, constituting all the claims in the case.

The disclosure is directed to a method for updating the value of an alarm limit on a process variable involved in catalytic chemical conversion of hydrocarbons.

We reproduce claim 1 as representative:

> 1. A method for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons wherein said alarm limit has a current value of
>
> $$Bo + K$$
>
> wherein Bo is the current alarm base and K is a predetermined alarm offset which comprises:
>
> (1) determining the present value of said process variable, said present value being defined as PVL:
>
> (2) determining a new alarm base, B_1, using the following equation:

> $$B_1 = Bo\ (1.0\text{-}F) + PVL\ (F)$$
>
> where F is a predetermined number greater than zero and less than 1.0;
>
> (3) determining an updated alarm limit value which is defined as
>
> $B_1 + K$; and, thereafter
>
> (4) adjusting said alarm limit to said updated alarm limit value.

A single rejection is now outstanding against the claims, the examiner having withdrawn a rejection under 35 USC 112 in his answer.

Claims 1-10 have been rejected under 35 USC 101 as being drawn to an invention which is not one of the types of invention set forth in that section of the statute. The examiner states his position in the final rejection as follows:

> "—The only difference between the claims and the prior art is in the mathematical formula involved in updating the value of an alarm limit.
>
> It is the Examiner's opinion that the claims are in fact drawn to an algorithm. A patent containing these claims would in effect be a patent on the algorithm itself."

The examiner cites *In re* Christensen, 178 USPQ 35, in support of his position.

Beginning on page 4 of his brief, appellant urges that the Christensen case places a narrow construction upon *Gottschalk* v. *Benson*, 175 USPQ 673. It is urged that the last recited step 4 of the present claims, since it does not involve the solving of a mathe-

matical equation, distinguishes the claims of the instant case from the principles enunciated in Christensen. We have given careful consideration to the arguments advanced by appellant in his brief and reply brief in the light of the rejection as applied in the final rejection and answer. We agree with the examiner. Appellant, in his specification, beginning with paragraph two of page 1, has outlined conventional practice of operating with fixed alarm limits in hydrocarbon processing as practiced in industry and, as the examiner has pointed out, on page 2, lines 5-10 of the specification, appellant has acknowledged the manual updating of fixed alarm limits as conventional. Appellant has contributed formulas to be used in the calculation of alarm limits and indicates in his specification, page 6, line 11 et seq., that he prefers to do this without human manipulation of alarm limits by electronic means. Beginning at page 6, line 21 of the specification, he has this to say:

> "—This preferred embodiment of the present invention may be achieved by practicing the method of the present invention in conjunction with conventional automatic, e.g., electronic, monitoring-alarming equipment. Thus, automatic monitoring-alarming equipment may be supplied with the relevant alarm offset K and number F as well as the mathematical relationships needed to make certain determinations involved in the present method. The monitoring-alarming equipment periodically scans the PVL and determines the updated alarm limit(s) using the method of the present invention. The alarm limit(s) of the

> monitoring-alarming equipment are automatically adjusted, if necessary, to the UAV determined by the method of the present invention. The automatic equipment which may be used in this embodiment of the present invention is conventional and well-known in the art."

We draw the conclusion from these statements that appellant proposes to use conventional automatic alarm adjusting equipment and that the invention is in the method, that is, the formulas or algorithm disclosed and claimed. Appellant has cited two portions of the Christensen decision in support of his arguments. We would add a third portion which lies between the two. We reproduce the portions cited by appellant with a portion added by us:

> "—The issue before us in the instant case is also a narrow one, namely, is a method claim in which the point of novelty is a mathematical equation to be solved as the final step of the method, a statutory method? We follow the Supreme Court in concluding that the answer is in the negative. Given that the method of solving a mathematical equation may not be the subject of patent protection, it follows that the addition of the old and necessary antecedent steps of establishing values for the variables in the equation cannot convert the unpatentable method to patentable subject matter.
>
> In reaching our conclusion in the light of Benson, we find it unnecessary to discuss the correctness or the rationale of any of our prior decisions in a line of cases starting with In re Abrams, 38 CCPA 945, 188 F.2d 165, 89 USPQ 266 (1951).

> Each new appeal must be decided on its own facts and in view of interpretations of the patent law as handed down by the Supreme Court of the United States."

We find appellant's arguments unpersuasive from our reading of the above quoted portions of Christensen. It seems to us that Christensen must be considered a recent pronouncement by the court in construing *Gottschalk* v. *Benson*, *supra*, as applied to method claims directed to algorithms practiced by computer.

Conventional automatic monitoring-alarm equipment of the kind acknowledged by appellant to be old would appear to encompass an adjusting step such as step (4) of claim 1. This being so, we think that the coupling of such steps to others such as (2) and (3) which recite the formulas or algorithm of appellant's method would not render the claims patentable in view of the principles stated in Christensen. We will sustain the rejection.

The decision of the examiner is affirmed.

AFFIRMED

BOARD OF APPEALS

WALTER W. BURNS, JR.
Examiner-in-Chief

RICHARD A. SPENCER
Examiner-in-Chief

WILLIAM F. LINDQUIST
Examiner-in-Chief
(Acting)

APPENDIX C

OPINION AND DECISION OF BOARD OF APPEALS AUGUST 24, 1976

Paper No. 20

Before Burns and Spencer, Examiners-in-Chief, and Lindquist, Acting Examiner-in-Chief.

Burns, Examiner-in-Chief.

UPON REQUEST FOR RECONSIDERATION

In a paper filed June 4, 1976, appellant requests that we reconsider our decision dated May 19, 1976, wherein we affirmed a rejection of claims 1-10 under 35 USC 101.

Appellant takes exception to our application of *In re Christensen*, 178 USPQ 35, urging that the case is inapposite for the reason that the claims there in issue differed from the prior art by means of a computing step which was embodied in the *final* step of the claim. Appellant on page 3 of his request makes the following statement:

> "The *express* language of the court in *In re Christensen* limits the authority of that case to claims wherein the *final* step involves solving a mathematical relationship . . .
>
> As noted above, the final recited step, i.e., step (4), of the present claims involves adjusting an alarm limit to an updated alarm limit and *does not* involve solving a mathematical equation."

We consider appellant's argument to be specious for we do not understand the substance of the *Christensen* decision to be based upon the fact that *Christensen* happened to include the step in issue as the final step of his claim. Had the step there in issue been next to last, we think the result would have been the same. We would again point to the question put as the first sentence of that portion of *Christensen* which we quoted on page 4 of our decision, namely:

> "—The issue before us in the instant case is also a narrow one, namely, is a method claim in which *the point of novelty* is a mathematical equation to be solved as the final step of the method, a statutory method?" (Emphasis ours)

We perceived the point of novelty in appellant's claimed method to be found in steps (2) and (3). We do not think that their numerical position in the claim, not being the final step, is controlling.

We have reviewed our original decision in the light of appellant's most recent remarks, in particular those quoted above and also his argument found in the final paragraph of page 3 of the most recent paper to the effect that he considers that he is not seeking to claim a mathematical algorithm. We find no basis for modifying our original decision.

Appellant's request is granted to the extent that we have in fact reviewed our original decision, but is denied as to making any change therein.

DENIED

BOARD OF APPEALS

WALTER W. BURNS, JR.
Examiner-in-Chief

RICHARD A. SPENCER
Examiner-in-Chief

WILLIAM F. LINDQUIST
Examiner-in-Chief
(Acting)

☆ U. S. GOVERNMENT PRINTING OFFICE: 1977 249468 84

Supreme Court, U. S.
FILED
MAR 3 1978
MICHAEL RODAK, JR., CLERK

APPENDIX

In the Supreme Court of the United States

OCTOBER TERM, 1977

No. 77-642

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS, PETITIONER

v.

DALE R. FLOOK

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

PETITION FOR A WRIT OF CERTIORARI FILED NOVEMBER 2, 1977
CERTIORARI GRANTED JANUARY 16, 1978

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*The opinion of the Court of Customs and Patent Appeals below is reproduced as Appendix A to the petition for writ of certiorari.

U.S. GOVERNMENT PRINTING OFFICE: 1978

IN THE MATTER OF THE APPLICATION OF DALE R. FLOOK

Term and Docket No. 77–512

Board of Appeals; Serial No. 194,032

[Filing Date October 29, 1976]

For: Method for Updating Alarm Limits

Counsel for appellant: Frank J. Uxa, Commissioner of Patents and Trademarks

Date	Proceedings and Orders
1977	
Jan. 24	Printed Transcript of Record, filed.
Mar. 21	Brief for Appellant, filed.
May 2	Brief for Commissioner of Patents & Trademarks, filed.
June 3	Argued
Aug. 4	Reversed, Baldwin, Judge.
Aug. 26	Final Mandate issued this date to the Commissioner of Patents and Trademarks
Nov. 2	Petition for Writ of Certiorari filed in the Supreme Court of
1978	the U.S. No. 77–642.
Jan. 16	Petition for Writ of Certiorari granted.

256-017—78——1

In the Supreme Court of the United States

OCTOBER TERM, 1977

No. 72-642

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS, PETITIONER

v.

DALE R. FLOOK

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

Patent Appeal No. 77-512

Transmittal Letter, October 29, 1971

The COMMISSIONER OF PATENTS,
Washington, D.C. 20231

SIR: Transmitted herewith for filing is the patent application of

Inventor: DALE R. FLOOK
For: METHOD
Enclosed are:
[ ] ——— sheets of drawing.
[ ] An assignment of the invention to ———

[ ] A certified copy of ———————— application.

[ ] Associate power of attorney.

CLAIMS AS FILED					
	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) BASIC FEE $65.00
	TOTAL CLAIMS	10 -10=	0	x $2.00	0.00
	INDEPENDENT CLAIMS	1 -1=	0	x $10.00	0.00
			TOTAL FILING FEE →		$ 65.00

[ ] Please charge my Deposit Account No. ———— in the amount of $ ————. A duplicate copy of this sheet is enclosed.

[ ] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Account No. ————. A duplicate copy of this sheet is enclosed.

[X] A check in the amount of $65.00 to cover the filing fee is enclosed.

Applied

FRANK J. UXA,
Attorney of Record.

October 27, 1971.

APPLICATION OF DALE R. FLOOK

[Filed October 29, 1971] Serial No. 194,032

FOR METHOD FOR UPDATING ALARM LIMITS

ABSTRACT OF THE DISCLOSURE

A method for updating the values of alarm limits on process variables involved in a process comprising catalytic chemical conversion of hydrocarbons is disclosed. The method utilizes the present value of the process variable in question, the current value of the alarm limit, an alarm offset K and a number F to provide an updated value for the alarm limit.

This invention relates to improved process monitoring systems. More particularly, the invention relates to process alarm systems which facilitate increased safety and efficiency in process operation.

Throughout the hydrocarbon processing industries, e.g., petroleum refining, petrochemical industry and the like, numerous catalytic conversion processes, e.g., naphtha reforming, gas oil hydrocracking and desulfurization, aromatic and paraffin isomerization and disproportionation, paraffin-olefin alkylation and the like, involve process variables, e.g., temperature, pressure, heat input, flow rates and the like, which are monitored to insure safe and efficient process operation. The variables monitored include those not directly associated in the catalytic conversion of hydrocarbons, e.g., heat input (measured by temperature increase) to a bed of catalyst prior to the introduction of hydrocarbon and the like, as well as variables directly associated with hydrocarbon conversion, e.g., reaction temperature, pressure and the like. Because of the large number of variables which may require monitoring, a practice has arisen whereby a fixed alarm limit (or limits) is set for each individual process variable. In this situation, the value of the process variable may vary within the fixed alarm limit.

However, if the variable value moves outside this fixed alarm limit, the operating personnel may be automatically notified, usually by an alarm sounding, of this circumstance which can then be corrected to insure the safety and efficiency of the process. Therefore, these fixed alarm limits simplify the task of monitoring a set of process variables.

However, these fixed alarm limits do have serious disadvantages which reduce their effectiveness. First, the values of these fixed alarm limits are set for one specific operating situation, for example, a steady state flow rate of 5 gal./min. with fixed alarm limits at 4 gal./min. and 6 gal./min. If, for any reason, the steady state operation is altered, for example, to a flow rate of 6.5 gal./min., the fixed alarm limits may have to be manually updated to reflect this change. If a large number of process variables are changed, the manual updating of the fixed alarm limits becomes a tedious and time-consuming job for the operating personnel. Also, manual changing of the fixed alarm limits may increase the possibility of human error since the new fixed alarm limits may not be set properly.

Another disadvantage of the fixed alarm limit concept of process monitoring is seen when the processing operation is in a transient, rather than a steady state, operating situation, e.g., process start-up, recovery from a process upset, batch-type or other processes in which the values of one or more process variables are expected to change with time and the like. In these "normal" transient situations, violations of the fixed alarm limits may often be signalled without any abnormal process condition occurring. These "false alarms" tend to reduce the reliability of the monitoring-alarm system and may cause the operating personnel to disregard all alarm warnings, including those signalling true abnormal conditions. In general, since the fixed alarm limits may be ineffective during process transcience, process monitoring may be more difficult, and process safety and efficiency may be decreased during transient operation.

Therefore, one of the objects of the present invention is to provide a method for determining updated alarm limits for process variables the values of which may vary to accommodate different process operations.

An additional object of the present invention is to provide a method whereby the reliability of process alarm signals as indications of process conditions requiring attention is improved.

A further object of the present invention is to provide an improved method for updating alarm limits for process variables the values of which normally change with time. Other objects and advantages of the present invention will become apparent hereinafter.

It has now been found that the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons can be advantageously updated by the following method. The current value of the alarm limit (CAV) may be used to define the current alarm base, denoted as Bo, as follows:

$$CAV=Bo+K$$

wherein K is a predetermined alarm offset. At a steady state process operation in which the process variable in question has a constant value, K represents the difference between the constant value of the alarm limit and the constant value of the process variable in question.

The present method comprises:

(1) determining the present value, denoted as PVL, of the process variable in question,

(2) determining a new alarm base, denoted as B_1, using the following equation:

$$B_1=Bo\ (1.0-F3+(PVL)\ F$$

where F is a predetermined number greater than zero and less than 1.0; and

(3) adjusting said alarm limit to an updated value, UAV, which is defined as

$$UAV=B_1+K$$

The alarm offset K may be of any predetermined value. Typically, the alarm offset K may be within the range from about 0.1% to about 50% or more, preferably from about 0.1% to about 25%, of the normal present value of the process variable whose alarm limit is being updated. For example, if the normal present value of the reaction or reactor (e.g., catalyst bed) temperature is 600° F., the alarm offset K can be within the range from about 0.6° F. to about 300° F., preferably within

the range from about 0.6° F. to about 150° F. Similarly, if the reaction or reactor pressure has a normal present value of 1700 psi., the alarm offset K may be within the range from about 1.7 psi., to about 800 psi., preferably within the range from about 1.7 psi. to about 425 psi. Typical ranges for alarm offsets for other process variables can be determined in an analogous manner.

The alarm offset K and number F used in the method of the present invention are predetermined based upon experience with the normal behavior with time of the individual process variable in question. For example, if a given process variable is to be maintained within a relatively narrow range, the values for K and/or F may be relatively small. On the other hand, if the process variable may vary over a wide range without indicating or giving rise to a process upset, the values for K and/or F may be relatively large. Also, the value of F will vary depending on the frequency with which the value of the alarm limit is updated according to the present invention. For example, the value of F may increase as the time between the updates is increased. In short, the values assigned to K and F may be determined through routine experimentation, taking into account the normal behavior and criticality of the process variable in question, as well as frequency of alarm limit updating and the like considerations.

In many instances, the method of the present invention may be used to determine two updated alarm limits, i.e., an upper alarm limit and a lower alarm limit, for a single process variable. For example, reactor or reaction temperature may have an upper alarm limit and a lower alarm limit. When the method of the present invention is used to update both upper and lower alarm limits on a process variable, the alarm offset and number F may be the same (provided that the sign on K is inverted) or different for each updated alarm limit determined. When upper and lower updated alarm limits on a single process variable are to be determined, it is preferred that the same number F and absolute value of alarm offset K be used in determining each updated alarm limit. In this circumstance, if the updated upper alarm limit is determined using K, the updated lower alarm limit is determined using –K (i.e., minus K) in place of K in the present method. Of course, the method of the present invention may

be used to determine two or more updated alarm limits for a single process variable using different values for K and/or F.

The method of the present invention may be used to update the alarm limits on process variables the values of which either normally remain constant, for example, in steady state operation, or exhibit transcient behavior, i.e., are expected to change with time for at least a portion of the processing interval or cycle. However, it is preferred to use the present method to update alarm limits on process variables which exhibit transcient behavior, i.e., transcient variables. Among the reasons for this preference is the fact that the present invention provides for determination of updated alarm limits by taking into account the present or current value of the variable. Thus, the value of the transcient variable may exhibit its normal transcient behavior without violating any alarm limits. However, abnormal transcient behavior does violate the updated alarm limit or limits. Thus, the present invention substantially reduces false alarm limit violations for transcient variables and, therefore, provides a more reliable process alarm system.

Although the method of the present invention may be used to manually update alarm limits, it is preferred that the present method be used so that alarm limits may be adjusted to updated values automatically, i.e., without human manipulation of the alarm limits, e.g., by electronic means. This preferred embodiment provides for quick efficient updating of alarm limits with a minimum chance for human error as well as being particularly useful, e.g., labor-saving, when a large number, e.g., more than about 10, updated alarm limits are to be determined and/or the transcient nature of a process variable(s) requires frequent monitoring or alarm limit updating. This preferred embodiment of the present invention may be achieved by practicing the method of the present invention in conjunction with conventional automatic, e.g., electronic, monitoring-alarming equipment. Thus, automatic monitoring-alarming equipment may be supplied with the relevant alarm offset K and number F as well as the mathematical relationships needed to make certain determinations involved in the present method. The monitoring-alarming equipment periodically scans the PVL and determines the updated alarm limit(s) using the method of the present invention. The alarm limit(s) of the monitoring-alarming equipment are automatically ad-

265-017—78——2

justed, if necessary, to the UAV determined by the method of the present invention. The automatic equipment which may be used in this embodiment of the present invention is conventional and well-known in the art.

The present invention may be used to update the value of alarm limits on process variables involved in processes comprising the catalytic chemical conversion of hydrocarbons, such as that involved in petroleum refining and petrochemical processing and the like. Included among these conventional and well known hydrocarbons conversion processes in which the present method is applicable are the following: naphtha reforming and desulfurization; petroleum distillate and petroleum residuum cracking, hydrocracking and desulfurization; aromatic hydrocarbon and paraffin isomerization and disproportionation; olefin di- and tri-merization; paraffin-olefin alkylation and the like processes. As noted previously, the alarm limits which may be updated according to the present invention include not only those directly used to control the hydrocarbon chemical conversion, e.g., reaction temperature, reaction pressure, reactant and poduct flow rates, and the like; but also those variables which indirectly affect the efficiency of the chemical conversion. Examples of this latter type of variable include: reaction zone temperature and/or pressure when hydrocarbon is not being processed, for instance, when the catalyst is being treated to improve its activity or to otherwise prepare it for the introduction of hydrocarbon; and the like variables.

Typical operating conditions and catalyst compositions employed in these conventional processes comprising catalytic chemical conversion of hydrocarbons are well known to those skilled in the art and may be varied to meet the requirements of the individual hydrocarbon processes. For this reason, individual process conditions and catalyst compositions are not enumerated herein. The values of K and F used in the method of the present invention can also be set depending on the hydrocarbon conversion process involved, the nature of the process variable being monitored, as well as the requirements and capabilities of the individual hydrocarbon processor.

The present method has further particular applicability in updating the value of alarm limits on process variables involved in processes comprising petroleum distillate hydrocracking.

Hydrocracking is a general term applied to refining processes wherein hydrocarbon feedstocks of relatively high molecular weight are chemically converted to mixtures of hydrocarbons of lower molecular weights and wherein the conversion is carried out at elevated temperature and pressure in the presence of a hydrogen-containing gas. In hydrocracking, typically, hydrocarbon feeds such as catalytic cycle oils and gas oils boiling in the range of about 350° F. to 1,000° F., are catalytically hydrocracked in the presence of hydrogen-containing gas to obtain gasoline boiling range products and light distillates. The process conditions which are employed in the hydrocracking process can be selected over a relatively wide range and are correlated, according to the nature of the hydrocarbon feed and of the particular catalyst employed, so as to produce either a desired conversion; i.e., as the percentage of feed converted to product, or a product of a desired octane number. Satisfactory conversions are obtained with the above described feedstocks at pressures in the range from about 200 psig. to about 2,000 psig. and temperatures in the range from about 400° F. to about 1,000° F. Advantageously, pressures in the range from about 750 psig. to about 1,800 psig. and temperatures in the range from about 500° F. to about 850° F. are employed.

Typical space velocities used in the hydrocracking reaction zone, expressed herein as liquid hourly space velocity (LHSV) in terms of volume of oil charged to the reaction zone per hour per volume of catalyst, may range from about 0.1 LHSV to about 10 LHSV, normally from about 0.2 LHSV to about 5 LHSV and preferably from about 0.25 LHSV to about 2 LHSV.

Hydrogen is consumed in the hydrocracking process and it is necessary to maintain an excess of hydrogen in the reaction zone. The hydrogen to hydrocarbon feed ratio is normally in the range from about 1,000 to about 20,000 standard cubic feet of hydrocarbon gas per barrel of feed (scfb), preferably in the range from about 5,000 scfb to about 15,000 scfb.

The catalyst employed in the hydrocracking process may be selected from the various well known hydrocracking catalysts which typically comprise a hydrogenation component and a solid acidic cracking component. The acidic cracking component

of the catalyst may comprise one or more solid acidic components such as silica-alumina (naturally occurring and/or synthetic) silica-magnesia, silica-alumina-zirconia, and the like. Also, acid-treated-aluminas, with or without halogen, polyacid-treated-aluminas, i.e., treated with phosphotungstic acid, phosphovanadic acid, silicotungstic acid, silicomolybdovanadic acid and the like, may be employed. A preferred acidic component of the catalyst composition is one of the commercially available synthetic silica-alumina cracking catalysts which may contain about 5% to about 40% by weight, of alumina. Preferably, the acidic component of the catalyst is employed as a support and it is highly porous, having a surface area in the range from about 100 $m^2/gm.$ to about 500 $m^2/gm.$ The preparation and properties of the acidic cracking components are well known in the art and, therefore, need not be described further herein for the purpose of the present invention.

Many of the well-known metallic hydrogenation catalysts may be incorporated in the hydrocracking catalyst, but preferably, the metallic constituent of this catalyst is selected from the metals of Group VIII of the Periodic Table which possess satisfactory hydrogenation activities, especially nickel, platinum, cobalt, palladium, rhodium and ruthenium. The hydrogenation component of the catalyst advantageously can be incorporated into the catalyst by impregnating a porous acidic cracking component with a heat-decomposable compound of the hydrogenation metal, followed by calcining to provide a composite. Typically, a silica-alumina cracking catalyst or an acid-treated alumina base is impregnated with a solution of nickel acetate, chloroplatinic acid or the like, and then dried followed by pelleting and calcining at an elevated temperature, e.g., about 1,000° F.

The following examples illustrate the method of the present invention.

Example I

Startup procedure for a distillate hydrocracking process employing a reactor bed of solid catalyst calls for a controlled temperature increase with the time in the reactor bed prior to introduction of the hydrocarbon feedstock. The reactor bed temperature is increased by circulating hydrogen through a fired heater and then to the reactor bed. The process variable, i.e.,

reactor bed temperature, has an upper alarm limit. This alarm limit is updated using the method of the present invention. From experience, it was determined that if the reactor bed temperature is to be monitored every 10 minutes, an alarm offset K of +9° F. and a number F of 0.60 provide satisfactory control.

With the reactor bed temperature at 432° F., the alarm limit is set at 441° F. Therefore, Bo=CAV—K or 441° F.—9° F. which is 432° F. The reactor bed temperature is monitored every ten minutes and an updated alarm limit is to be determined each time the variable is monitored. After 10 minutes, the reactor bed temperature has risen to 436° F. The value of B_1 is determined as follows:

$$B_1 = Bo\ (1—F) + PVL(F)$$

$$B_1 = 432\ (0.4) + 436\ (0.6) = 434.4°\ F.$$

The updated alarm limit is determined as follows:

$$UAV = B_1 + K = 434.4°\ F. + 9°\ F. = 443.4°\ F.$$

After 20 minutes, the reactor bed temperature has risen to 440.5° F. The current alarm base value, Bo, is

$$CAV - K = 443.4°\ F. - 9°\ F. = 434.4°\ F.*$$

The new alarm base value, B_1, is as follows:

$$B_1 = 434.4°\ F.\ (1.0—0.6) + 440.5\ (0.6)$$

$$B_1 = 438.1°\ F.$$

Therefore, the updated alarm limit is:

$$UAV = B_1 + K = 438.1°\ F. + 9°\ F. = 447.1°\ F.$$

Using the method of the present invention illustrated by the above procedure at 10 minute intervals, the following results were obtained:

*Note that the value of Bo is the same as the last previously determined value of B_1

Time, min.	Reactor bed temp. °F.	Current alarm limit, °F.	Updated alarm limit, °F.
0	432	441	----------
10	436	441	443. 4
20	440. 5	443. 4	447. 1
30	444. 5	447. 1	450. 9
40	448	450. 9	454. 6
50	453. 5	454. 6	456. 3
60	457	456. 3	463. 3
70	461. 5	463. 3	467. 6
80	465. 5	467. 6	471. 7
90	473	471. 7	477. 9
100	490	477. 9	490. 6
110	515	490. 6	510. 6

An alarm was signaled indicating an excessive temperature increase at some point between 100 and 110 minutes. Corrective action may be taken to remedy this situation.

Example II

This example illustrates the use of electronic monitoring-alarming equipment in conjunction with the method of the present invention.

The processing system used in this example is similar to that employed in Example I. The electronic monitoring-alarm equipment was the same as that conventionally employed in the dydrocarbon processing industries. The value of the process variable in question, i.e., reactor bed temperature, was inputed to this automatic equipment which scanned this value once every minute. The various relationships needed to practice the method of the present invention were also inputed to this equipment. The alarm offset K was set at 9° F. and F was given a value of 0.025. Initially, the alarm limit was manually set. Each time the reactor bed temperature was scanned, this alarm limit was automatically updated according to the method of the present invention. The new, i.e., updated, alarm limit was set by the automatic equipment without human interference and without the possibility of human error.

Below is a tabulation, at 10 minute intervals, of the reactor bed temperatures scanned and alarm limits determined according to the present invention using the electronic equipment as described above.

Time, min.	Reactor bed temp. °F.	Current alarm limit, °F.	Updated alarm limit, °F.
0	432	441	----------
10	436. 6	441	445. 3
20	440. 8	445. 3	449. 5
30	444. 9	449. 5	453. 6
40	449. 1	453. 6	457. 7
50	453. 2	457. 7	461. 9
60	457. 3	461. 9	466. 0
70	461. 5	466. 0	470. 2
80	465. 6	470. 2	474. 3
90	472. 7	474. 3	478. 7
100	482. 7	478. 7	484. 1
110	492. 7	484. 1	490. 7

An alarm was indicated between 100 and 110 minutes (actually after the 104th minute) indicating an excessive rise in the reactor bed temperature.

The preceding examples illustrate many of the advantages of the present invention. If a fixed alarm limit had been set on the reactor bed temperature in the above illustrations, repeated false alarms would have been signaled, or the fixed limit set so high as to be ineffective in calling attention to an abnormal condition. Thus, these illustrations show that fixed alarm limits are of marginal usefulness during transcient process operation. On the other hand, alarm limits updated by the method of the present invention allow normal transcience of the variable value while still calling attention to truly abnormal conditions. Using the method of the present invention in conjunction with automatic monitoring-alarming equipment has added advantages including reducing tedious labor as well as the risk of human error, and allowing more variables to be controlled.

While this invention has been described with respect to various specific examples and embodiments, it is to be understood that the invention is not limited thereto and that it can be variously practiced within the scope of the following claims.

The embodiments of the invention in which an exclusive property of privilege is claimed are defined as follows:

1. A method for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons wherein said alarm limit has a current value of

$$Bo+K$$

where Bo is the current alarm base and K is a predetermined alarm offset which comprises:

(1) determining the present value of said process variable, said present value being defined as PVL;

(2) determining a new alarm base, B_1, using the following equation:

$$B_1=Bo(1.0-F)+PVL\ (F)$$

where F is a predetermined number greater than zero and less than 1.0;

(3) adjusting said alarm limit to an updated value which is defined as

$$B_1+K$$

* * * * *

For Claim 2, see Rejected Claim 2.

3. The method of claim 1 wherein step (3) comprises automatically adjusting said alarm limit to an updated value which is defined as B_1+K.

* * * * *

For Claims 4 to 10 inclusive, see Rejected Claims 4 to 10 inclusive.

Declaration, Power of Attorney, and Petition

Sole Original (SEAL)

Case No. 13-0039

I, Dale R. Flook, declare that I am a citizen of the United States of America residing at P.O. Box 787, Wilmington, California 90744 that I have read the foregoing specification and claims and I verily believe I am the original, first, and sole inventor of the invention in

METHOD

described and claimed therein; that I do not know and do not believe that this invention was ever known or used before my invention thereof, or patented or described in any printed publication in any country before my invention thereof, or more than one year prior to this application; or in public use or on sale in the United States more than one year prior to this application; that this invention has not been patented in any country foreign to the United States on an application filed by me or my legal representatives or assigns more than twelve months before this application; and that no application for patent on this invention has been filed by me or my representatives or assigns in any country foreign to the United States, except as follows:

I hereby appoint Thomas J. Clough, Frank J. Uxa and Blucher S. Tharp having Registration Numbers 22337, 25612 and 19502, respectively, my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith.

The Patent Office is requested to direct all mail to said Thomas J. Clough at the following address:

ATLANTIC RICHFIELD COMPANY
400 East Sibley Boulevard
Harvey, Illinois 60426

256-017—78——3

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Wherefore I pray that Letters Patent be granted to me for the invention described and claimed in the foregoing specification and claims, and I hereby subscribe my name to the foregoing specification and claims, declaration, power of attorney, and this petition, this 22 day of October, 1971.

Inventor:	Dale	Rowen	Flook
	(First Name)	(Middle Initial)	(Last Name)

400 East Sibley Boulevard, Harvey, Illinois 60426
(P.O. Address)

This form may be executed only when attached to a complete application as the last page thereof.

Letter of Examiner, September 24, 1973

Paper No. 7

[ ] This application has been examined.
[X] Responsive to communication filed 7–9–1973 & 9–4–1973
[ ] This action *is made final.*

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS ACTION IS SET TO EXPIRE 3 MONTH(S) ~~DAYS~~ FROM THE DATE OF THIS LETTER.

PART I

THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION

a. [ ] Notice of References Cited, Form PO–892.
b. [ ] Notice of Informal Patent Drawing, PO–948.
c. [ ] Notice of Informal Patent Application, Form PO–152.
d. [ ]

PART II

SUMMARY OF ACTION

1. [X] Claims 1–10 are presented for examination.
2. [ ] Claims ———— are allowed.
3. [ ] Claims ———— would be allowable if amended as indicated.
4. [X] Claims 1–10 are rejected.
5. [ ] Claims ———— are objected to.
6. [ ] Claims ———— are subject to restriction or election requirement.
7. [ ] Claims ———— are withdrawn from consideration.
8. [ ] Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 OG. 213.
9. [ ] Since it appears that a discussion with applicant's representative may result in agreements whereby the

application may be placed in condition for allowance, the examiner will telephone the representative within about 2 weeks from the date of this letter.

10. [ ] Receipt is acknowledged of papers under 35 USC 119, which papers have been placed of record in the file.
11. [ ] Applicant's claim for priority based on an application filed in _____ on _____ is acknowledged. It is noted, however, that a certified copy as required by 35 USC 119 has not been received.
12. [ ] Other.

The final rejection is withdrawn in order to add a new rejection of all claims under 35 USC 101. This rejection is being made in accordance with the recent court decision in In re Christensen 178 USPQ 35.

Claims 1–10 are rejected under 35 USC 101 as being drawn to an invention which is not one of the types of inventions set forth in 35 USC 101 as patentable under the Statutes. It appears that the only difference between these claims and the prior art is in the mathematical formula involved in updating the value of an alarm limit.

It is the Examiner's opinion that the claims are in fact drawn to an algorithm or a patent containing these claims would in practical effect be a patent on the algorithm itself.

Except for the term "automatically" in claim 3 which term is unsupported by structure or method steps, the claims clearly read on an operator making "pencil and paper" calculations and adjusting the controls accordingly.

Claims 3, 6, 9 & 10 are rejected under 35 USC 112, 1st paragraph as being drawn to an invention insufficiently disclosed for reasons stated in the objection to the specification.

The specification is objected to under 35 USC 112, 1st paragraph in that it fails to disclose the invention claimed. There is insufficient disclosure of how the alarm limits are "automatically" adjusted and of the electronic means.

Applicant in his response of July 9, 1973, on page 3 thereof, states that the "Summary Manual is of particular importance in that it illustrates that adjustable alarm limits may be used with this conventional automatic equipment".

No where in the publications accompanying the amendemnt is there a showing that automatic-alarming equipment supplied with the relevant alarm offset K and number F as well as the mathematical relationships needed to make certain determinations involved, is conventional.

Eugene G. Botz,
EUGENE G. BOTZ,
Examiner,
Group Art Unit 236.

SEPTEMBER 21, 1973.

Letter to Office, December 19, 1973

Letter "B"

Hon. COMMISSIONER OF PATENTS,
Washington, D. C. 20231

SIR: The above-identified application has been carefully reviewed in light of the Examiner's Communication mailed September 24, 1973. Applicant acknowledges the Examiner's action in withdrawing the final rejection stated in the communication mailed May 7, 1973.

Claims 1 to 10 have been rejected under 35 U.S.C. 101 as being drawn to an invention which is not one of the types of inventions patentable under the Statutes. Applicant traverses this rejection.

The present invention comprises an improved method for updating at least one alarm limit value on at least one process variable involved in a catalytic conversion process. The method involves predetermining an alarm offset K, determining the present value of the process variable in question, determining a new alarm base B_1 according to a specified mathematical relationship, defining an updated alarm limit value as B_1+K, and adjusting the alarm limit to the updated value. This adjusting of the alarm limit, which is a positive step of the method recited in claims 1 to 10, may be done automatically, i.e., without human manipulation of the alarm limits, for example, by electronic means.

The Examiner states that the present claims clearly read on an operator making "pencil and paper" calculations and adjusting the controls accordingly. The Examiner's position is that the decision in In re Christensen, (CCPA), 178 U.S.P.Q. 35, holds that such claims are unpatentable.

In In re Christensen, patent protection was sought for a method of determining the porosity of subsurface formations. This method involved determining a series of factors and finally determining the porosity by solving a mathematical relation-

ship involving such factors. In deciding this case, the Court of Customs and Patent Appeals stated, in pertinent part, as follows:

> The issue before us in the instant case is also a narrow one, namely, is a method claim in which the point of novelty is a mathematical equation to be solved as the *final step* of the method, a statutory method? We follow the Supreme Court in concluding that the answer is in the negative. Given that the method of solving a mathematical equation may not be the subject of patent protection, it follows that the addition of the old and necessary antecedent steps of establishing values for the variables in the equation cannot convert the unpatentable method to patentable subject matter. [Emphasis added]

The above-identified application is clearly distinguished from the holding in In re Christensen. For example, solving a mathematical relationship is not the final step of applicant's method. Also, unlike In re Christensen, applicant's method does not involve solving a methematical relationship simply to determine a value. Applicant does not seek to patent a mathematical relationship or algorithm. The present claims positively recite that the updated alarm limit value as determined is used in adjusting at least one alarm limit on at least one process variable involved in a catalytic conversion process. Thus, applicant has clearly invented a method useful within the technological arts as required by 35 U.S.C. 101. In re Waldbaum (CCPA), 173 U.S.P.Q. 430. This is contrary to In re Christensen wherein the claims involved conventional antecedent steps necessary to the final step of solving a mathematical relationship simply to determine a value. Since the above-identified application is clearly distinguished from In re Christensen and since the statute has clearly been complied with, applicant submits that claims 1 to 10 are drawn to patentable subject matter under 35 U.S.C. 101.

Claims 3 to 6, 9 and 10 are rejected under 35 U.S.C. 112, first paragraph, as being drawn to an invention insufficiently disclosed. Applicant traverses this rejection.

Applicant has discovered an improved method for automatically updating and adjusting at least one alarm limit on at least one process variable using, for example, electronic means.

The method involves predetermining a number F between zero and 1.0 and an alarm offset K. On pages 6 and 7 of the specification, applicant has disclosed that automatic monitoring-alarming equipment is supplied with K, F and certain mathematical relationships needed to determine the updated alarm limit. The equipment scans and determines the present value of the process variable in question. Using this value and the other inputs noted above, the equipment determines at least one updated alarm limit and adjusts the alarm limit according to the present method. This embodiment is also illustrated in Example II of the above-identified application. In each instance, the equipment, e.g., electronic means, which may be used to automatically adjust alarm limits according to the present invention is conventional and well known in the art.

In order to demonstrate that such equipment is conventional and well known in the art, applicant has previously submitted the following publications:

> Wherry, T.C. et al, *Direct Digital Control*, Chemical Engineering Progress, Vol. 64, No. 4, pp. 33–38 (April 1968).
>
> *Summary Manual/BE–DDC Direct Digital Control*, pp. 4 and 5 Copyright 1969 by General Electric.
>
> *GE/PAC 4020, System Summary Manual*, p. 2–2 Copyright 1970 by General Electric Co.

The Examiner contends there is insufficient disclosure of how the alarm limits are automatically adjusted and of the electronic means. Specifically, the Examiner states that nowhere in the previouslv submitted publications is there a showing that automatic-alarming equipment supplied with the relevant alarm offset K and number F as well as the mathematical relationships needed to make certain determination involved, is conventional.

However, the *Summary Manual/GE–DDC Direct Digital Control* clearly refers to electronic equipment, e.g., computers, and soft wear packages which can be used to automatically adjust alarm limits in a manner defined by the user. For example, this reference at the bottom of the first column of page 5 states:

> Limit Check
>
> After filtering, inputs are compared to *adjustable* high and low limits which are *defined by user*. * * * [Emphasis added]

This reference does not teach, or even suggest, applicant's method of adjusting alarm limits, but it does clearly show that automatic equipment capable of adjusting alarm limits according to user definition is conventional. Further, *GE/PAC 4020, System Summary Manual* shows clearly that it is conventional to introduce mathematical relationships needed to adjust alarm limits into such automatic equipment. This latter reference describes one such conventional system as follows:

> BICEPS scans the process sensors, filters the measurements signals, performs limit checks, and computes set points. The process loops are defined by filling out special forms, from which punched cards are prepared for reading into the computer's memory. Individual loop control calculations may be specified through a special, but simple, BICEPS Programming Language (BPL). The language is similar to FORTRAN, and allows process engineers with little or no programming experience to define the specific calculations needed for each loop.

Again, this reference does not teach, or even suggest, the present invention, but does indicate that, given the present specification, it is well within the ordinary skill of the art to automatically adjust at least one alarm limit according to the present invention.

In view of the conventional nature of the automatic equipment, e.g., computers, and means, e.g., computer programs, for introducing mathematical relationships into such equipment, applicant submits that it is not necessary to detail such equipment and such means in order to enable one of ordinary skill in the art to practice the present invention. Since one of ordinary skill in the art, given the disclosure of the present specification, would be able to automatically adjust process alarm limits according to the present invention, applicant submits that claims 3 to 6, 9 and 10 satisfy the requirements of 35 U.S.C. 112, first paragraph.

Since claims 1 to 10 have been shown to be drawn to patentable subject matter under 35 U.S.C. 101 and claims 3 to 6, 9 and 10 have been shown to satisfy the requirements of 35 U.S.C. 112, first paragraph, applicant submits that these claims are allowable and respectfully requests the Examiner to pass the

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above-identified application to issuance at his earliest convenience.

Respectfully submitted,

By Frank J. Uxa
FRANK J. UXA,
Reg. No. 25,612,
Attorney for Applicant.

DECEMBER 17, 1973.

Letter of Examiner, March 7, 1974

Paper No. 9

[ ] This application has been examined.
[X] Responsive to communication filed 12–19–1973.
[X] This action is *made final.*

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS ACTION IS SET TO EXPIRE 3 MONTHS(S) ~~DAYS~~ FROM THE DATE OF THIS LETTER.

PART I

THE FOLLOWING ATTACHMENTS(S) ARE PART OF THIS ACTION

a. [ ] Notice of References Cited, Form PO–892.
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c. [ ] Notice of Informal Patent Application, Form PO–152.
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PART II

SUMMARY OF ACTION

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10. [ ] Receipt is acknowledged of papers under 35 USC 119, which papers have been placed of record in the file.
11. [ ] Applicant's claim for priority based on an application filed in _____ on _____ is acknowledged. It is noted, however, that a certified copy as required by 35 USC 119 has not been received.
12. [ ] Other.

Claims 1–10 are again rejected under 35 U.S.C. 101 as being drawn to an invention which is not one of the types of inventions set forth in 35 U.S.C. 101 as patentable under the Statutes. The only difference between the claims and the prior art is in the mathematical formula involved in updating the value of an alarm limit.

It is the Examiner's opinion that the claims are in fact drawn to an algorithm. A patent containing these claims would in effect be a patent on the algorithm itself.

Except for the term "automatically in claim 3, which term is unsupported by structure or method steps, the claims clearly read on an operator making "pencil and paper" calculations and adjusting the controls accordingly.

Applicant contends that he has clearly invented a method useful within the technological arts as required by 35 U.S.C. 101 and cites In re Waldbaum in support of his contention.

The manual method of practicing applicant's invention is clearly set forth in the application. This consists of making observations of a process variable. Calculating new alarm limits when the variable has changed and adjusting the limit on the alarm to correspond to the new calculated alarm limit.

The act of manually updating fixed alarm limits as process variables change is conventional. See page 2, lines 5–10 of applicants' specfication. A mathematical step of computing new alarm limits is obviously involved and finally a step is involved of adjusting the limit on the alarm to correspond to the new calculated alarm limit.

It would appear that in view of Waldbaum, applicant's contention is correct that he was clearly invented a method useful within the technological arts as required by 35 U.S.C. 101, however, in view of the later decision by the same court in In re Christensen they held that notwithstanding the fact that the process before them was obviously in the technological art, "that the addition of the old and necessary antecedent steps of establishing values for the variables in the equation cannot convert the unpatentable method to patentable subject matter."

The only difference between that which is conventional and that disclosed by applicant is the computation of the alarm limit, for this reason the claims are held to directed to an invention which is not one of the types of inventions set forth in 35 U.S.C. 101.

Claims 3–6, 9 and 10 are rejected and the specification objected to under 35 U.S.C. 112, 1st paragraphs in that they insufficiently discloses the invention. There is insufficient disclosure of how the alarm limits are "automatically" adjusted and of the electronic means used.

Applicant again makes reference to the three publications supplied in his response of July 9, 1973 as purporting to show that anyone skilled in the art could implement his invention. No where in these publications is there a showing of how the automatic-alarming equipment may be modified, either by hardware or by software, to accomplish applicant's invention of "automatically" carrying out his invention. Applicant quotes from one of the supplied publications on page 4, between lines 10 and 11 of his response of December 19, 1973. No where in this quote is there even a suggestion that the equipment updates the alarm limits without user intervention.

The other quote on the same page 4 between lines 18 and 19, fails to support applicants contention that it clearly shows automatic-alarming equipment. No where in this quote is there a mention that the limit checks involved computations. There is a mention of calculations but this is for control purposes.

This action is FINAL.

EUGENE G. BOTZ,
Examiner,
Group Art Unit 236.

Amendment, May 23, 1974

10

Hon. COMMISSIONER OF PATENTS,
Washington, D.C. 20231

SIR: Please amend the above-identified application as follows:

IN THE CLAIMS:

* * * * *

For Claims 1 and 3, see Rejected Claims 1 and 3.

* * * * *

Remarks

The above-identified application has been carefully reviewed and amended in light of the Examiner's communication mailed March 7, 1974, which included a final rejection of all claims presented. Since the above-identified application has been amended to be allowable, or, if necessary, in better form for appeal, applicant requests that this SECOND AMENDMENT UNDER RULE 116 be entered.

Claim 1 has been amended to make clear that after the updated alarm limit value is determined, the relevant alarm limit is adjusted to this updated alarm limit value. This amendment is fully supported by the present specification, for example, at page 3, line 10 to page 4, line 5 and the Examples. Claim 3 has been amended to be consistent with claim 1.

Claims 1 to 10 have been rejected under 35 U.S.C. 101 as being drawn to an invention which is not one of the types of inventions set forth as patentable. Applicant traverses this rejection.

The present invention comprises a new and technologically useful method for adjusting at least one alarm limit on at least one process variable involved in a catalytic conversion process to an updated alarm limit value. The present method comprises:

(1) determining the present value of the process variable in question; (2) determining a new alarm base using a defined mathematical relationship; (3) determining an updated alarm limit value equal to the new alarm base plus a predetermined alarm offset; and thereafter, (4) adjusting the alarm limit to the updated alarm limit value. Step 4, i.e., adjusting the alarm limit to the updated alarm limit value, is a positive step of the method recited in claims 1 to 10 and clearly does not involve the solving of a mathematical relationship.

The Examiner contends that claims 1 to 10 are drawn to the mathematical relationships involved in steps 2 and 3 of the present claims and, therefore, these claims are drawn to unpatentable subject matter under 35 U.S.C. 101. To support his position that the claims are drawn to unpatentable subject matter, the Examiner relys on In re Christensen, CCPA, 178 U.S.P.Q. 35. The Examiner does state that the present claims would be directed toward patentable subject matter under 35 U.S.C. 101 if the holding of In re Waldbaum, CCPA, 173 U.S.P.Q. 430, applied. However, the Examiner contends that In re Christensen overrules the holding of In re Waldbaum.

However, the Court In re Christensen clearly intended the holding in that case to have only limited applicability. For example, the Court in the last paragraph of page 37 states:

> * * * The issue before us in the instant case is also a *narrow* one, namely, is a method claim in which at the point of novelty is a mathematical equation to alarm limits.

In brief, the Examiner is attempting to extend the expressly narrow holding of In re Christensen to preclude the patentability of the present claims. Applicant submits that the Examiner has no basis for such extension. The present fact situation, as noted above, is distinguished from the facts of In re Christensen. Clearly, In re Christensen does not even touch, let alone, overrule, the validity of In re Waldbaum. This is particularly true in view of the Court's statement in In re Christensen that:

> * * * In reaching our conclusion * * * we find it unnecessary to discuss the correctness or the rationale of any of our prior decisions * * *

For these reasons and since the present method is admittedly useful within the technological arts, applicant submits that claims 1 to 10 are drawn to patentable subject matter under 35 U.S.C. 101.

Claims 3 to 6, 9 and 10 have been rejected under 35 U.S.C. 112, first paragraph, as being drawn to an invention which is insufficiently disclosed. Applicant traverses this rejection.

The presently rejected claims are directed to a method for automatically adjusting at least one alarm limit on at least one process variable which comprises (1) determining the present value of the process variable in question; (2) determining a new alarm base using the present value of the process variable and a defined mathematical relationship; (3) determining an updated alarm limit value equal to the new alarm base plus a predetermined alarm offset; and thereafter (4) automatically, i.e., without human manipulation of the alarm limit, adjusting the alarm limit to the updated alarm limit value. This embodiment of the present invention can be carried out using conventional automatic monitoring-alarming equipment, e.g., a digital computer. Applicant submits that the present disclosure describes the invention in such full, clear, concise and exact terms as to enable one skilled in the art to practice it.

Applicant has previously submitted publications which demonstrate that the present specification is sufficient to enable one skilled in the art to practice the present invention. Two quotations from one of these publications, i.e., *Summary Manual/GE–DDC Direct Digital Control*, i.e., "Summary Manual", are as follows:

> Limit Check
>
> After filtering, inputs are compared to *adjustable* high and low limits which are defined by user. * * * [Emphasis added]
>
> BICEPS scans the process sensors, filters the measurements signals, performs limit checks, and computes set points. The process loops are defined by filling out special forms, from which punched cards are prepared for reading into the computer's memory. Individual loop control calculations may be specified through a special, but simple, BICEPS Programming Language (BPL). The language is similar to FORTRAN, and allows process engineers with little or no programming experience to define the specific calculations needed for each loop.

These two quotations, while not even suggesting the present invention, make clear the conventional nature of the hardware, e.g., automatic equipment, and software, e.g., computer programs, which can be used in practicing the present invention. The first quote refers to several functions of a digital computer used in process monitoring-alarming and control. Thus, "Summary Manual" teaches a computer which functions to automatically adjust alarm limits according to a user supplied, e.g., programmed, definition. In the second quote, "Summary Manual" teaches that software, e.g., BICEPS, is available which can be used in conjunction with this digital computer to adjust limits according to a defined program and make comparitive checks.

The Examiner contends that the first quote from "Summary Manual" does not include even a suggestion that the equipment updates the alarm limit without user intervention. Further, the Examiner contends that there is no mention that the limit checks involve computations.

Figure 6 on page 4 of "Summary Manual" is a graphic illustration of basic direct digital control. It is clear from the context of "Summary Manual" that the functions set forth in each of the four boxes, i.e., Scan, Input Processing, Output Computation and Output, of Figure 6 are performed automatically, i.e., by digital computer. In particular, Input Processing is strictly an automatic function, in other words, no continuing input from outside the computer is present nor is there any signal directed outside the computer. Since such Input Processing involves no continuing input from outside the computer, the user defined adjustable limits referred to in the first quotation above are adjustable by computations performed totally within the computer according to a supplied program. Also, since the limits referred to in this first quotation are so adjustable, it follows that the general reference to limit checks in the second quotation can involve computations to, for example, determine the updated value of an adjustable limit. Thus, "Summary Manual", taken as a whole, teaches that limits can be adjusted automatically using conventional means, e.g., digital computers and available software. Since such means is conventional and

236-017—78——5

well known in the art, the present specification describing means for automatically adjusting alarm limits as such is sufficient to enable one skilled in the art to practice the present invention. Therefore, applicant submits that claims 3 to 6, 9 and 10 satisfy the requirement of 35 U.S.C. 112, first paragraph and are allowable.

In addition, the Examiner's attention is directed to Great Britain Patent 923,799 (British) which was cited of interest in the Examiner's Communication mailed October 25, 1972, in the above-identified application. This reference relates to automatic monitoring-alarming equipment (page 1, lines 9 to 13). In particular, British, as page 1, lines 49 to 67, is as follows:

> According to another aspect of the present invention a safety, alarm, or like circuit for a monitoring system in which cyclically appearing monitored signals derived from respective monitoring means are compared with a reference signal, includes means for storing the average value of a succession of monitored signals in a cycle, *means for computing a new average value in dependence upon the value of each succeeding monitored signal,* comparator means for comparing the value of each said succeeding monitored signal value with the new average value, and a safety, or alarm, device arranged to be operated when the comparator means detect a discrepancy between a said monitored signal value and the stored average value and in excess of a predetermined amount. [Emphasis added]

Thus, British, while not teaching or even suggesting the present invention, clearly teaches that the present value of a monitored signal is used in *computing* an updated alarm limit value (new average value) to which the alarm limit is then automatically adjusted. In short, British, by teaching one such means, clearly demonstrates that means for automatically adjusting alarm limits are conventional and well known in the art. Therefore, since British confirms the statement in the present specification that automatic alarming-monitoring equipment capable of carrying out the present invention is conventional and well known in the art, applicant submits that the present disclosure is sufficient to enable one skilled in the art to practice the invention set out in claims 3 to 6, 9 and 10. For this additional reason, applicant submits that these claims satisfy the requirements of 35 U.S.C. 112, first paragraph and are allowable.

Since claims 1 to 10 have been shown to be drawn to patentable subject matter under 35 U.S.C. 101 and claims 3 to 6, 9 and 10 have been shown to satisfy the requirements of 35 U.S.C. 112, first paragraph, applicant submits that these claims are allowable and respectfully requests the Examiner to pass the above-identified application to issuance at his earliest convenience.

Respectfully submitted,

By Frank J. Uxa
FRANK J. UXA,
Reg. No. 25,612,
Attorney for Applicant.

MAY 20, 1974.

Letter of Examiner, June 10, 1974

Paper No. 11

ADVISORY ACTION

[X] THE PERIOD FOR RESPONSE IS EXTENDED TO RUN 4 MONTHS *FROM THE DATE OF THE FINAL REJECTION*. 855 O.G. 1109.

[X] Appellant's Brief is due in accordance with Rule 192(a).

Applicant's response to the final rejection, filed 5-23-74, has been considered with the following effect, but it is not deemed to place the application in condition for allowance:

1. [ ] The proposed amendments to the claims and/or specification will not be entered and the final rejection stands because:
   a. [ ] There is no convincing showing under Rule 116(b).
   b. [ ] They raised new issues that would require further consideration and/or search.
   c. [ ] They raise the issue of new matter.
   d. [ ] They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal.
   e. [ ] They present additional claims without cancelling a corresponding number of finally rejected claims.
2. [ ] Newly proposed or amended claims ——— would be allowed if submitted in a separately filed amendment cancelling the non-allowable claims.
3. [X] Upon the filing of an appeal, the proposed amendment [X] will be [ ] will not be, entered and the status of the claims in this application would be as follows:

   a. [ ] Claims ——— would be allowable.
   b. [X] Claims 1-10 would not be allowable.

   However:

   (1) [ ] The rejection of claims ——— on references is deemed to be overcome by applicant's response.

   (2) [X] The rejection of claims ——— on non-reference grounds only is deemed to be overcome by applicant's response.

4. [ ] The affidavit, exhibit or request for reconsideration has been entered but does not overcome the rejection.
5. [ ] The affidavit or exhibit will not be admitted because applicant has not shown good and sufficient reasons why it was not earlier presented.
6. [ ] The application having been examined under the special accelerated examining procedure (M.P.E.P. 708.02), the proposed amendment has not been considered since it does not prima facie place the application in condition for allowance or in better condition for appeal.

Eugene G. Botz

EUGENE G. BOTZ,

Examiner,

Group Art Unit 236.

Appeal to Board of Appeals, July 9, 1974

No. 12

To Commissioner of Patents

SIR: Applicant hereby appeals to the Board of Appeals from the decision dated March 7, 1974 of the Primary Examiner finally rejecting claims 1 to 10.

The item(s) checked below are appropriate:

1. [ ] An extension of time to respond to the final rejected was granted on ———— for ———— month(s).
2. [X] A timely response to the final rejection has been filed, as provided in 841 O.G. 1411.
3. [X] Fee $50.00:
   - [ ] Enclosed
   - [X] Not required (Fee paid in prior appeal) Fee Paid September 4, 1973.
   - [ ] Charge to Deposit Account No. ————. (One additional copy of this Notice is enclosed herewith.)

Respectfully submitted,

Frank J. Uxa,
FRANK J. UXA,
Reg. No. 25,612,
Attorney for Applicant(s).

JULY 1, 1974.

Brief, August 19, 1974

No. 13

Hon. COMMISSIONER OF PATENTS,
Washington, D.C. 20231.

SIR: This is an appeal from the Final Rejection of March 7, 1974, finally rejecting claims 1 to 10, all the claims in the case. A Second Amendment Under Rule 116 will be entered upon the filing of the present appeal. Therefore, claims 1 to 10 remain in the case and are before The Board of Appeals.

ORAL HEARING

An oral hearing is requested.

* * * * *

For Claims 1 to 10 inclusive, see Rejected Claims 1 to 10 inclusive.

THE INVENTION

The present invention relates to an improved method for adjusting at least one alarm limit on at least one process variable involved in a catalytic conversion process to an updated alarm limit value. The present method comprises: (1) determining the present value of the process variable in question; (2) determining a new alarm base using a defined mathematical relationship; (3) determining an updated alarm limit value which is equal to the new alarm base plus a predetermined alarm offset; and thereafter, (4) adjusting the alarm limit to the updated alarm limit value. In a preferred embodiment, step 4 of the present invention comprises automatically, i.e., without human manipulation of the alarm limit, adjusting the alarm limit to the updated alarm limit value. This embodiment can be carried out using conventional automatic monitoring-alarming equipment, for example, electronic means such as a digital computer.

DESCRIPTION OF THE REFERENCES

No references have been cited against the present claims.

THE EXAMINER'S REJECTION

Claims 1 to 10 have been rejected under 35 U.S.C. 101 as being drawn to an invention which is not one of the types of inventions set forth in 35 U.S.C. 101 as patentable under the Statutes. The Examiner contends that the present claims are drawn to the mathematical relationships recited in steps 2 and 3 of the present method and, further, that In re Christensen, CCPA, 178 U.S.P.Q. 35, overruled the holding of In re Waldbaum, CCPA, 173 U.S.P.Q. 430. Therefore, the Examiner concludes that the present claims are drawn to subject matter which is unpatentable under 35 U.S.C. 101.

Claims 3 to 6, 9 and 10 have been rejected under 35 U.S.C. 112, first paragraph, as being drawn to an invention which is insufficiently disclosed by the specification. The Examiner contends that there is insufficient disclosure as to how the alarm limits are automatically adjusted and of the electronic means used.

THE ISSUES

The legal issues on appeal are:

Whether claims 1 to 10 are directed to an invention of the types patentable under 35 U.S.C. 101.

Whether claims 3 to 6, 9 and 10 are supported by sufficient disclosure under 35 U.S.C. 112, first paragraph.

The factual issue to be determined with regard to the legal issue under 35 U.S.C. 101 is as follows:

Whether the claimed invention is directed to a new and useful method.

The factual issue to be determined with regard to the legal issue under 35 U.S.C. 112, first paragraph is as follows:

Whether the present specification describes the invention of claims 3 to 6, 9 and 10 in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention.

APPELLANT'S ARGUMENTS WITH REGARD TO THE REJECTION UNDER 35 U.S.C. 101

Appellant has discovered a new and technologically useful method for adjusting at least one alarm limit on at least one process variable involved in a catalytic conversion process to an updated alarm limit value. The present method comprises: (1) determining the present value of the process variable in question; (2) determining a new alarm base using a defined mathematical relationship; (3) determining an updated alarm limit value which is equal to the new alarm base plus a predetermined alarm offset; and thereafter, (4) adjusting the alarm limit to the updated alarm limit value. Step 4, i.e., adjusting the alarm limit to the updated alarm limit value, is a *separate and positive* step of appellant's method set forth in claims 1 to 10 and clearly does not involve the solving of a mathematical relationship.

The Examiner contends that the present claims are drawn to the mathematical relationships involved in steps 2 and 3 and that, therefore, these claims are drawn to unpatentable subject matter under 35 U.S.C. 101. To support his position, the Examiner relies on In re Christensen, CCPA, 178 U.S.P.Q. 35. The Examiner does state that the present method is useful in the technological arts and that the present claims would be directed toward patentable subject matter under 35 U.S.C. 101 if the holding of In re Waldbaum, CCPA, 173 U.S.P.Q. 430, applied. However, the Examiner contends that In re Christensen overruled the holding of In re Waldbaum.

Therefore, one question which must be resolved is whether, in fact, In re Christensen did overrule the holding of In re Waldbaum so as to render the present claims unpatentable under 35 U.S.C. 101. In essence, In re Waldbaum holds that a method which is useful in the technological, i.e., useful, arts is a statutory method within the meaning of 35 U.S.C. 101. In the later case, the Court clearly intended the holding of In re Christensen to have only limited applicability. For example, the Court in In re Christensen at the last paragraph of page 37 states:

> * * * The issue before us in the instant case is also a *narrow* one, namely, is a method claim in which the

> point of novelty is a mathematical equation to be solved as the *final step* of the method, a statutory method? [Emphasis added]

The Court answered the narrow question presented in the negative. Thus, In re Christensen holds that: A method claim in which the point of novelty is a mathematical equation to be solved as the final step of the method is unpatentable under 35 U.S.C. 101. Moreover, it is also very clear that the Court did not believe this holding should be extended beyond the precise facts of In re Christensen.

Appellant submits that the narrow holding of In re Christensen does not negate the patentability of the present claims under 35 U.S.C. 101. For example, while In re Christensen narrowly holds that a method in which the solving of a novel Mathematical equation is the *final step* is not a statutory method, *step 4 of the present claims,* i.e., adjusting the alarm limit to the updated alarm limit value, *does not involve the solving of a mathematical equation.* The claims rejected In re Christensen were directed toward solving a mathematical relationship merely to determine an abstract value, i.e., the porosity of a rock formation. The present claims are not drawn to an abstract mathematical relationship or algorithm. Appellant seeks patent protection for a technologically useful method for adjusting at least one alarm limit on at least one process variable involved in a process comprising catalytic chemical conversion of hydrocarbons.

The Examiner is attempting to extend the expressly narrow holding of In re Christensen to overrule In re Waldbaum and, thus, to preclude the patentability of the present claims under 35 U.S.C. 101. Appellant submits that the narrow holding of In re Christensen does not even touch, let alone, overrule, In re Waldbaum. For example, the Court in In re Christensen, at the first full paragraph of page 38, states that:

> • • • In reaching our conclusion in light of Benson (Gottschalk, Comr. Pat. V. Benson et al, U.S. Supreme Ct., 175 U.S.P.Q. 673), we find it unnecessary to discuss the correctness or the rationale of any of our prior decisions in a line of cases starting with In re Abrams, 38 CCPA 945, 188 F. 2d. 165, 89 U.S.P.Q. 266 (1951).

Thus, it is clear that the Court expressly limits the holding of In re Christensen to the precise fact situation involved and that

In re Christensen does not overrule the holding of In re Waldbaum.

In summary, the narrow holding of In re Christensen that a method claim in which the point of novelty is a mathematical equation to be solved as the final step of the method is unpatentable does not negate the patentability of the present claims under 35 U.S.C. 101. For example, the last recited step of the present claims, i.e., step 4, does not involve the solving of a mathematical equation. Appellant has discovered a technologically useful method for adjusting at least one alarm limit on at least one process variable involved in a process comprising catalytic chemical conversion of hydrocarbons. Such a method involves patentable subject matter under the holding of In re Waldbaum and as noted above, the expressly narrow holding of In re Christensen does not overrule In re Waldbaum. Therefore, appellant submits that claims 1 to 10 are drawn to patentable subject matter under 35 U.S.C. 101.

APPELLANT'S ARGUMENTS WITH REGARD TO THE REJECTION UNDER 35 U.S.C 112, FIRST PARAGRAPH

Appellant has discovered an improved method for automatically adjusting at least one alarm limit on at least one process variable using, for example, electronic means such as a digital computer. The method involves predetermining a number F between zero and 1.0 and an alarm offset K. On pages 6 and 7 of the present specification, appellant has disclosed that automatic monitoring-alarming equipment is supplied with K, F and certain mathematical relationships needed to determine the updated value of the alarm limit. The equipment scans and determines the present value of the process variable in question. Using this value and the other inputs noted above, the equipment determines at least one updated alarm limit value and, thereafter, automatically adjusts the alarm limit to this updated alarm limit value. This embodiment is also llustrated in Example II of the above-identified application. In each nstance, the equipment, e.g., electronic means such as a digital computer, which may be used to automatically adjust alarm limits according to the present invention is conventional and well known in the art.

The present method involves certain mathematical relationships. In order to input these mathematical relationships into

the conventional automatic monitoring alarming equipment and calculate an updated alarm limit, the equipment must be given instructions, for example, in the form of a computer program. Appellant has fully disclosed the mathematical relationships used to update alarm limits according to the present invention. Having this disclosure, it is well within the ordinary skill of the art to program such conventional equipment to update alarm limits according to the present invention.

In order to show that such automatic monitoring-alarming equipment, e.g., electronic means, which can be used to automatically adjust alarm limits according to the present invention is conventional and well known in the art, copies of the following are attached hereto:

> Wherry, T.C. et al, *Direct Digital Control,* Chemical Engineering Progress, Vol. 64, No. 4, pp. 33–38 (April 1968). (Exhibit A)
>
> *GE/PAC 4020, System Summary Manual,* p. 2–2, Copyright 1970 by General Electric Co. (Exhibit B)
>
> *Summary Manual/GE–DDC Direct Digital Control,* pp. 4 and 5, Copyright 1969 by General Electric Co. (Exhibit C)

Each of these publications refers to automatic equipment involving a digital computer which can be used for automatic process monitoring-alarming. For example, Wherry et al teaches that such equipment can check the present value of a process variable against pre-set alarm limits and, if necessary, initiate an alarm (page 34, last paragraph starting in column 3).

Two quotations, the first from *Summary Manual/GE–DDC Direct Digital Control* and the second from *GE/PAC 4020, System Summary Manual* of particular importance are as follows:

> Limit Check
>
> After Filtering, inputs are compared to *adjustable* high and low limits which are defined by user. * * * [Emphasis added]
>
> * * * * * *
>
> BICEPS scans the process sensors, filters the measurements signals, performs limit checks and computes set points. The process loops are defined by filling out special forms, from which punched cards are prepared for reading into the computer's memory. Individual loop control calculations may be specified through a special, but simple, BICEPS programming Language (BPL). The language is similar to Fortran, and allows process engineers with little or no programming experience to define the specific calculations needed for each loop.

These two quotations, while not even suggesting the present invention, make clear the conventional nature of the hardware, e.g., automatic equipment and software, e.g., computer programs, which can be used in practicing the present invention. The first quote refers to several functions of a digital computer used in automatic monitoring-alarming and process control. Thus, it is conventional for a computer to automatically adjust alarm limits according to a user supplied, e.g., programmed, definition. The second quote refers to conventional computer software, e.g., computer programs, which can be used in conjunction with, for example, the digital computer described previously to adjust alarm limits according to a user-defined program and make comparative checks.

Figure 6 on page 4 of *Summary Manual/GE–DDC Direct Digital Control* is a graphic illustration of basic direct digital control. The functions set forth in each of the four boxes, i.e., Scan, Input Processing, Output Computation and Output, of Figure 6 are performed automatically, i.e., by digital computer. In particular, Input Processing is strictly an automatic function. In other words, with regard to Input Processing, no continuing input from outside the computer is present, nor is there any signal directed outside the computer. Since such Input Processing involves no continuing input from outside the computer, the adjustable values of the user-defined limits referred to in the first quotation above are determined by computations performed totally within the computer according to a supplied program. Further, it is clear that the adjustable limits are automatically updated to reflect the new limit value. Also, since the values of the limits referred to in this first quotation are so adjustable, it follows that the general reference to limit checks in the second quotation can involve computations to, for example, determine the updated limit value which is then used to automatically update the adjustable limit.

In addition, the Board's attention is directed to Great Britain Patent 923,799 (British), a copy attached as Exhibit D, which

was cited of interest in the Examiner's Communication mailed October 25, 1972, in the above-identified application. This reference relates to automatic monitoring-alarming equipment (page 1, lines 9 to 13). In particular, British, at page 1, lines 49 to 67, is as follows:

> According to another aspect of the present invention a safety, alarm, or the like circuit for a monitoring system in which cyclically appearing monitored signals derived from respected monitoring means are compared with a reference signal, includes means for storing the average value of a succession of monitored signals in a cycle, *means for a computing a new average value in dependence upon the value of each succeeding monitored signal,* comparator means for comparing the value of each said succeeding monitored signal value with the new average value, and a safety, or alarm, device arranged to be operated when the comparator means detect a discrepancy between a said monitored signal value and the stored average value and in excess of a predetermined amount. [Emphasis added]

Thus, British, while not teaching or even suggesting the present invention, clearly teaches that the present value of a monitored signal is used in *computing* an updated alarm limit value (new average value) to which the alarm limit is then automatically adjusted. In short, British, by teaching one such means, clearly demonstrates that means for automatically adjusting alarm limits are conventional and well known in the art. Therefore, British confirms the statement in the present specification that alarming-monitoring equipment capable of automatically adjusting alarm limits according to the present invention is conventional and well known in the art.

In summary, the prior art, for example, *GE/PAC 4020, System Summary Manual, Summary Manual/GE–DDC Direct Digital Control* and Great Britain Patent 923,799, taken as a whole, teaches that alarm limits can be automatically adjusted using conventional means, e.g., electronic digital computers and available software. Since such means is conventional and well known in the art, the present specification describing means for automatically adjusting alarm limits as such is sufficient to enable one skilled in the art to practice the invention. In re Myers, CCPA, 161 U.S.P.Q. 668; In re Nelson, CCPA, 126

U.S.P.Q. 242. Therefore, appellant submits that the present disclosure is in such full, clear, concise and exact terms as to enable one skilled in the art to practice the invention set out in claims 3 to 6, 9 and 10 and that, therefore, these claims satisfy the requirements of 35 U.S.C. 112, first paragraph and are allowable.

CONCLUSION

Since the present claims have been shown to be directed to patentable subject matter under 35 U.S.C. 101 and to be supported by the present specification sufficiently to satisfy the requirements of 35 U.S.C. 112, first paragraph, appellant submits that the above-identified application is allowable and respectfully requests This Honorable Board of Appeals to reverse the Examiner's Final Rejection and hold claims 1 to 10 allowable.

Respectfully submitted,

By Frank J. Uxa
FRANK J. UXA,
Reg. No. 25,612,
Attorney for Appellant.

AUGUST 15, 1974.

Examiner's Answer, October 9, 1974

Paper No. 14

This is an appeal from the final rejection of Claims 1–10: no claims having been allowed.

A correct copy of the appealed claims appears on pages 1 and 2 of Appellant's brief.

THE GROUND OF FINAL REJECTION

Claims 1–10 are rejected under 35 U.S.C. 101 as being drawn to an invention which is not one of the types of inventions set forth in 35 U.S.C. 101 as patentable under the Statute. For a clear exposition of this rejection, the statements set forth in the final rejection are incorporated herein by reference.

The rejection made under 35 U.S.C. 112 is withdrawn.

RESPONSE TO APPELLANT'S ARGUMENTS WITH REGARDS TO THE REJECTION UNDER 35 U.S.C. 101

The Appellant contends that "one question which must be resolved is whether, in fact, In re Christensen did overrule the holding of In re Waldbaum". Appellant contends that In re Christensen is applicable only where a mathematical equation to be solved is the final step of the method.

In re Christensen was cited to show that not all methods within the technological arts are patentable under 35 U.S.C. 101 and that the addition of the old and necessary antecedent steps of establishing values for the algorithm does not convert the unpatentable method to patentable subject matter.

The question to be asked about any invention which involves a formula, algorithm or control technique is wherein is the invention. Evidently, this question was considered and the Court gave their answer in In re Christensen. The fact that the final step of the method, under consideration, was a mathematical equation made the issue a clearer one for the Court to decide. Appellant, apparently, believes that if Christensen had manu-

ally taken the results of the equation and applied them to some control in an obvious and well known manner wherein the only difference over the prior control art was the use of a specific equation for computing this value, Christensen would have an invention under 35 U.S.C. 101. That is if other methods of deriving this value had been used in the control art in the past and Christensen merely found a new mathematical formula or algorithm for developing this value he would have an invention under 35 U.S.C. 101. Here the Examiner draws different conclusions. The Examiner contends that even before Christensen, Waldbaum and other previous decisions, that mathematics as such, and those inventions wherein there was nothing new over the prior art exterior to the formula or mathematics were never considered patentable under 35 U.S.C. 101.

Throughout his remarks Appellant contends that his invention is a technologically useful invention and therefore must be considered as one of the types of inventions set forth in 35 U.S.C. 101.

The Examiner agrees that his invention is a technologically useful invention, however, it is not one of the types of inventions set forth in 35 U.S.C. 101. As explained below a patent granted on Appellant's method or apparatus would in practical effect be a patent on the formula or mathematics itself.

Considering Appellant's description of the prior art on Page 2 of his specification, he states: "the fixed alarm limits may have to be manually updated to reflect this change. If a large number of processes available are changed, the manual updating of the fixed alarm limits becomes a tedious and time-consuming job for the operating personnel. Also, manual changing of the fixed alarm limits may increase the possibility of human error since the new fixed alarm limits may not be set properly." It is obvious from this quote that it has been the practice for control personnel to calculate or rely on previous experience to make a predetermined change in the alarm limit. If we now describe in the languages of appellant's claim the steps taken in making a limit change as taught by the prior art we obviously would have the following steps which the operator must do: (1) determine the present value of the process, (2) (3) determine updated alarm limit value and (4) adjust the alarm limit to the updated alarm limit value. Steps (2) and (3) are mathematical steps for determining an updated alarm limit value.

The mathematical steps (2) and (3) consist of the formulas $B_1 = Bo(1-F) + PVL(F)$ and $UAV = B_1 + K$. The term B represents an alarm base (bo being correct base, B_2 being the new base), PVL is the term representing present process variable, UAV is the updated alarm limit, and K and F equals alarm offset and a predetermined number respectively.

Appellant, on page 4 of his brief, states that the alarm offset K and number F used in the present invention are predetermined, based upon experience with the normal behavior with time of the individual process variable in question, and on page 5 that the values assigned to K and F may be determined through routine experimentation.

It is interesting to note the disclosure on page 4 of Appellant's specification wherein he states: For example, if a given process variable is to be maintained within a relatively narrow range, the values for K and/or F may be relatively small. On the other hand, if the process variable may vary over a wide range without indicating or giving rise to a process upset, the values for K and/or F may be relatively large. Also. the value of F will vary depending on the frequency with which the value of the alarm limit is updated according to the present invention. For example, the value of F may increase as the time between updates is increased. Certainly anyone skilled in the control arts would routinely make the alarm offset K relatively small for process variables which must be maintained within a narrow range. The change due to the value F may not be explicit in a formula to one in the prior art, however, it is contended that inherently one skilled in the art would make adjustments which would reflect a determination such as F represents.

The Examiner has given his understanding of the prior art and how the steps of Appellant's method find their counterpart in this prior art. This analysis along with Appellant's discussion of the prior art wherein he states the disadvantages in the prior art that the job of alarm updating is tedious and time-consuming and that there is the possibility of human error persuade the Examiner that nothing new over the prior art exterior to the formula or mathematics has been produced.

When for the most part, one can only claim the elimination of tedium and human error when automating control and other processes, which are normally performed by humans there is, in

fact, no unexpected results. Mathematics is involved in automating these processes, however, considering the overall results nothing new over the prior art exterior to the mathematics has been produced. To grant patents on this type of invention would in fact be granting patents on formulas, mathematics, and algorithms. No longer would the skillful mathematician be prevented from patenting methods whose only reason for being different from the prior art is in the degree of mathematical sophistication.

A test which could be applied to control methods whose only apparent difference over the prior art appears to be in a mathematical formula or algorithm is would an operator having prior knowledge only, or a prior art system, have sufficient mental or physical ability respectively be expected to duplicate or even improve upon the results produced by the method or system under consideration with the exception of course that the system using mathematics may be faster, and less likely to error and become fatigued when comparing with a human operator.

It is the Examiner's contention that Appellant's results may be produced by an operator having only prior knowledge and that he operating within this prior knowledge could accomplish results even superior to Appellant's system or method, for in fact, the basis for the mathematical formulated method is derived from the mind of the operator.

Eugene G. Botz,
EUGENE G. BOTZ,
Examiner,
Group Art Unit 236.

OCTOBER 7, 1974.

Reply Brief, October 21, 1974

No. 15

Hon. COMMISSIONER OF PATENTS,
Washington, D.C. 20231

SIR: This reply, filed pursuant to Rule 193, is in response to the Examiner's Answer mailed October 9, 1974.

The Examiner now states that *In re Christensen*, CCPA, 178 U.S.P.Q. 35 was cited to show that not all methods within the technological arts are patentable under 35 U.S.C. 101. The Examiner contends that *In re Christensen* provides precedent for the position that any method, whether technologically useful or not, which involves solving a new mathematical equation is unpatentable under 35 U.S.C. 101. This is clearly not the case.

The Court in *In re Christensen* states:

> • • • The issue before us in the instant case is also a *narrow* one, namely, is a method claim in which the point of novelty is a mathematical equation to be solved as the *final step* of the method, a statutory method? [Emphasis added]

Since appellant's methods do not involve a mathematical equation to be solved as the final recited step, the Examiner is seeking to extend the *expressly* narrow holding of *In re Christensen*. However, the Court also made clear that such extension is unwarranted. For example, the Court stated that:

> • • • In reaching our conclusion in light of Benson (Gottschalk, Comr. Pat. v. Benson et al, U.S. Supreme Ct., 175 U.S.P.Q. 673), we find it unnecessary to discuss the correctness or the rationale of any of our prior decisions in a line of cases starting with In re Abrams, 38 CCPA 945, 188 F. 2d. 165, 80 U.S.P.Q. 266 (1951).

In short, *In re Christensen* provides no support for the Examiner's position. The Examiner is left to speculate as to what effect additional method steps would have had on the Court's decision. As noted above, the Court expressly limited the holding of *In re Christensen* to the facts involved. Speculation as

to what the Court would have done in an entirely different fact situation can hardly be used to render the present claims unpatentable under 35 U.S.C. 101. Since *In re Christensen* did not overrule any previous decision, appellant submits that the present admittedly technologically useful methods are patentable under 35 U.S.C. 101.

The Examiner appears for the first time to raise prior art as a basis for rejecting the claims in the above-identified application. Moreover, the Examiner contends that the only thing new about the present methods is the mathematical equations in steps (2) and (3).

No prior art references are, or have ever been, cited against the present claims. No prior art reference or references teach, or even suggest, appellant's invention. By resorting to appellant's disclosure to contend that the present invention is obvious, the Examiner makes clear that only after knowing of the above-identified application would one of ordinary skill in the art practice the present methods and obtain the outstanding benefits achieved by appellant. Moreover, appellant's invention involves a novel combination of steps which, when performed together as set forth in the present claims, achieve technologically useful and improved results. Appellant submits that this technologically useful combination of steps is patentable over the prior art and under 35 U.S.C. 101.

In conclusion, appellant respectfully requests this Honorable Board of Appeals to reverse the final rejection of the Examiner and holds claims 1 to 10 allowable.

Respectfully submitted,

By Frank J. Uxa
FRANK J. UXA,
Reg. No. 25,612,
Attorney for Appellant.

OCTOBER 18, 1974

Opinion and Decision of Board of Appeals, May 19, 1976

Paper No. 18

Before BURNS and SPENCER, Examiners-in-Chief, and LINDQUIST, Acting Examiner-in-Chief

BURNS, *Examiner-in-Chief:* This is an appeal from the final rejection of claims 1–10, constituting all the claims in the case.

The disclosure is directed to a method for updating the value of an alarm limit on a process variable involved in catalytic chemical conversion of hydrocarbons.

We reproduce claim 1 as representative:

1. A method for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons wherein said alarm limit has a current value of

$$Bo+K$$

wherein Bo is the current alarm base and K is a predetermined alarm offset which comprises:

(1) determining the present value of said process variable, said present value being defined as PVL:

(2) determining a new alarm base, B_1, using the following equation:

$$B_1=Bo\ (1.0-F)+PVL\ (F)$$

where F is a predetermined number greater than zero and less than 1.0;

(3) determining an updated alarm limit value which is defined as B_1+K; and, thereafter

(4) adjusting said alarm limit to said updated alarm limit value.

A single rejection is now outstanding against the claims, the examiner having withdrawn a rejection under 35 USC 112 in his answer.

Claims 1–10 have been rejected under 35 USC 101 as being drawn to an invention which is not one of the types of invention set forth in that section of the statute. The examiner states his position in the final rejection as follows:

> The only difference between the claims and the prior art is in the mathematical formula involved in updating the value of an alarm limit.
>
> It is the Examiner's opinion that the claims are in fact drawn to an algorithm. A patent containing these claims would in effect be a patent on the algorithm itself.

The examiner cites *In re* Christensen, 178 USPQ 35, in support of his position.

Beginning on page 4 of his brief, appellant urges that the Christensen case places a narrow construction upon *Gottschalk v. Benson,* 175 USPQ 673. It is urged that the last recited step 4 of the present claims, since it does not involve the solving of a mathematical equation, distinguishes the claims of the instant case from the principles enunciated in Christensen. We have given careful consideration to the arguments advanced by appellant in his brief and reply brief in the light of the rejection as applied in the final rejection and answer. We agree with the examiner. Appellant, in his specification, beginning with paragraph two of page 1, has outlined conventional practice of operating with fixed alarm limits in hydrocarbon processing as practiced in industry and, as the examiner has pointed out, on page 2, lines 5–10 of the specification, appellant has acknowledged the manual updating of fixed alarm limits as conventional. Appellant has contributed formulas to be used in the calculation of alarm limits and indicates in his specification, page 6, line 11 et seq., that he prefers to do this without human manipulation of alarm limits by electronic means. Beginning at page 6, line 21 of the specification, he has this to say:

> This preferred embodiment of the present invention may be achieved by practicing the method of the present invention in conjunction with conventional automatic, e.g., electronic, monitoring-alarming equipment. Thus, automatic monitoring-alarming equipment may be supplied with the relevant alarm offset K and number F as well as the mathematical relationships needed to make certain determinations involved in the

present method. The monitoring-alarming equipment periodically scans the PVL and determines the updated alarm limit (s) using the method of the present invention. The alarm limit (s) of the monitoring-alarming equipment are automatically adjusted, if necessary, to the UAV determined by the method of the present invention. The automatic equipment which may be used in this embodiment of the present invention is conventional and well-known in the art.

We draw the conclusions from these statements that appellant proposes to use conventional automatic alarm adjusting equipment and that the invention is in the method, that is, the formulas or algorithm disclosed and claimed. Appellant has cited two portions of the Christensen decision in support of his arguments. We would add a third portion which lies between the two. We reproduce the portions cited by appellant with a portion added by us:

> The issue before us in the instant case is also a narrow one, namely, is a method claim in which the point of novelty is a mathematical equation to be solved as the final step of the method, a statutory method? We follow the Supreme Court in concluding that the answer is in the negative. Given that the method of solving a mathematical equation may not be the subject of patent protection, it follows that the addition of the old and necessary antecedent steps of establishing values for the variables in the equation cannot convert the unpatentable method to patentable subject matter.
>
> In reaching our conclusion in the light of Benson, we find it unnecessary to discuss the correctness or the rationale of any of our prior decisions in a line of cases starting with In re Abrams, 38 CCPA 945, 188 F. 2d 165, 89 USPQ 266 (1951). Each new appeal must be decided on its own facts and in view of interpretations of the patent law as handed down by the Supreme Court of the United States.

We find appellant's arguments unpersuasive from our reading of the above quoted portions of Christensen. It seems to us that Christensen must be considered a recent pronouncement by the court in construing *Gottschalk* v. *Benson, supra,* as applied to method claims directed to algorithms practiced by computer.

Conventional automatic monitoring-alarm equipment of the kind acknowledged by appellant to be old would appear to encompass an adjusting step such as step (4) of Claim 1. This being so, we think that the coupling of such steps to others such as (2) and (3) which recite the formulas or algorithm of appellant's method would not render the claims patentable in view of the principles stated in Christensen. We will sustain the rejection.

The decision of the examiner is affirmed.

Affirmed by Board of Appeals:

WALTER W BURNS Jr.,
Examiner-in-Chief.

RICHARD A. SPENCER,
Examiner-in-Chief.

WILLIAM F. LINDQUIST,
Examiner-in-Chief (Acting).

Request for Reconsideration, June 4, 1976

No. 19

Hon. COMMISSIONER OF PATENTS AND TRADEMARKS,
Washington, D.C. 20231

SIR: Appellant requests reconsideration of the Board of Appeals' decision dated May 19, 1976, affirming the decision of the Examiner. Appellant had taken an appeal July 1, 1974, from the final rejection of the Examiner mailed March 7, 1974, of claims 1 to 10.

Board of Appeals Decision

The Board of Appeals affirmed the Examiner's decision by stating in relevant part:

> We find appellant's arguments unpersuasive from our reading of the above quoted portions of Christensen. It seems to us that Christensen must be considered a recent pronouncement by the court in construing *Gottschalk* v. *Bensen*, supra, as applied to method claims directed to algorithms practiced by computer.
>
> Conventional automatic monitoring-alarm equipment of the kind acknowledged by appellant to be old would appear to encompass an adjusting step such as step (4) of claim 1. This being so, we think that the coupling of such steps to others such as (2) and (3) which recite the formulas or algorithm of the appellant's method would not render the claims patentable in view of the principles stated in Christensen. We will sustain the rejection.

APPELLANTS' REQUESTED ACTION BY THE BOARD OF APPEALS UPON RECONSIDERATION

Appellants request reconsideration of the Board of Appeals decision dated May 19, 1976, and further request the allowance of claims 1 to 10.

APPELLANT'S ARGUMENTS FOR RECONSIDERATION

Appellants took an appeal from a final rejection mailed March 7, 1974, of claims 1 to 10. These claims had been finally rejected under 35 U.S.C. 101 as being drawn to an invention which is not one of the type of inventions set forth in that section of the statute.

The present claims are directed to a technologically useful method for updating at least one alarm limit on at least one process variable involved in catalytic chemical conversion of hydrocarbons. The present method involves determining certain values based upon mathematical relationships. *After* such determinations have been made, the present claims recite adjusting an alarm limit to the updated limit previously determined. ***The final recited step of the present claims does not involve solving a mathematical equation.***

The following quote from *In re Christensen*, 178 U.S.P.Q. 35, has been cited in support of the Board's position affirming the Examiner's rejection:

> The issue before us in the instant case is also a narrow one, namely, is a method claim in which the point of novelty is a mathematical equation to be solved as the *final* step of the method, a statutory method? We follow the Supreme Court in concluding that the answer is in the negative. Given that the method of solving a mathematical equation may not be the subject of patent protection, it follows that the addition of the old and necessary *antecedent* steps of establishing values for the variables in the equation cannot convert the unpatentable method to patentable subject matter.
>
> In reaching our conclusion in the light of Benson, we find it unnecessary to discuss the correctness or the rationale of any of our prior decisions in a line of cases starting with In re Abrams, 38 C.C.P.A. 945, 188 F. 2d 165, 89 U.S.P.Q. 266 (1951). Each new appeal must be decided on its own facts and in view of interpretations of the patent law as handed down by the Supreme Court of the United States. [Emphasis added]

The quoted portion of *In re Christensen* simply does not provide any support for the Board's position. The present claims are significantly different from the claims involved in *In re Christensen*. For example, the final step recited in the

present claims does not involve the solving of a mathematical equation. In contrast, the claims in issue in *In re Christensen* had as the *final* step: "computing the porosity of the formation from the relation * * * (detailed mathematical equation)". The *express* language of the court in *In re Christensen* limits the authority of that case to claims where the *final* step involves solving a mathematical relationship. Moreover, the present claims do not involve the addition of old and necessary antecedent steps for establishing values for the variable in an equation solved as a final step of the claim process or method. As noted above, the final recited step, i.e., step (4), of the present claims involves adjusting an alarm limit to an updated alarm limit and *does not* involve solving a mathematical equation.

Appellant is not seeking to claim a mathematical algorithm, as was the case in the claims at issue in *In re Christensen* and *Gottschalk* v. *Benson*, 409 U.S. 63, 175 U.S.P.Q. 673. The present claims are directed to technologically useful methods for updating an alarm limit involved in the catalytic chemical conversion of hydrocarbons. Appellant submits that no basis whatever exists, other than improper extension of the *In re Christensen*, holding, for rejecting the present claims under 35 U.S.C. 101.

For these reasons, appellant respectfully requests the Honorable Board of Appeals to reconsider their decision affirming the Examiner's rejection and hold claims 1 to 10 allowable in their present form.

Respectfully submitted,

By Frank J. Uxa
FRANK J. UXA,
Reg. No. 25,612,
Attorney for Appellant.

JUNE 3, 1976.

Opinion and Decision of Board of Appeals, August 24, 1976

Paper No. 20

Before BURNS and SPENCER, Examiners-in-Chief, and LINDQUIST, Acting Examiner-in-Chief

BURNS, *Examiner-in-Chief,*

UPON REQUEST FOR RECONSIDERATION

In a paper filed June 4, 1976, appellant requests that we reconsider our decision dated May 19, 1976, wherein we affirmed a rejection of claims 1–10 under 35 USC 101.

Appellant takes exception to our application of *In re Christensen*, 178 USPQ 35, urging that the case is inapposite for the reason that the claims there in issue differed from the prior art by means of a computing step which was embodied in the *final* step of the claim. Appellant on page 3 of his request makes the following statement:

> The *express* language of the court in *In re Christensen* limits the authority of that case to claims wherein the *final* step involves solving a mathematical relationship * * *
>
> As noted above, the final recited step, i.e., step (4), of the present claims involves adjusting an alarm limit to an updated alarm limit and *does not* involve solving a mathematical equation.

We consider appellant's argument to be specious for we do not understand the substance of the *Christensen* decision to be based upon the fact that *Christensen* happened to include the step in issue as the final step of his claim. Had the step there in issue been next to last, we think the result would have been the same. We would again point to the question put as the first sentence of that portion of *Christensen* which we quoted on page 4 of our decision, namely:

> The issue before us in the instant case is also a narrow one, namely, is a method claim in which *the point of novelty* is a mathematical equation to be solved as

the final step of the method, a statutory method? [Emphasis ours]

We perceived the point of novelty in appellant's claimed method to be found in steps (2) and (3). We do not think that their numerical position in the claim, not being the final step, is controlling.

We have reviewed our original decision in the light of appellant's most recent remarks, in particular those quoted above and also his argument found in the final paragraph of page 3 of the most recent paper to the effect that he considers that he is not seeking to claim a mathematical algorithm. We find no basis for modifying our original decision.

Appellant's request is granted to the extent that we have in fact reviewed our original decision, but is denied as to making any change therein.

Denied

Board of Appeals

WALTER W. BURNS, JR.,
Examiner-in-Chief.
RICHARD A. SPENCER,
Examiner-in-Chief.
WILLIAM F. LINDQUIST,
Examiner-in-Chief (Acting).

Notice and Reasons of Appeal to United States Court of Customs and Patent Appeals, September 20, 1976

No. 21

Hon. COMMISSIONER OF PATENTS AND TRADEMARKS,
Washington, D.C. 20231

SIR: Pursuant to the provisions of 35 U.S.C. 142, appellant through his attorney, hereby gives notice that an appeal is being taken to the United States Court of Customs and Patent Appeals from the decision of the United States Patent and Trademark Office Board of Appeals mailed May 19, 1976, and the decision on Request for Reconsideration mailed August 24, 1976, rejecting all the claims in the above-identified application and refusing a patent for the invention set forth therein.

The following are assigned as reasons of appeal:

The Board of Appeals erred in its decision mailed May 19, 1976 affirming the Examiner's rejection regarding claims 1 to 10 in the above-identified application. In addition, the Board of Appeals erred in a decision mailed August 24, 1976, denying a Request for Reconsideration of its original decision.

Specifically, the Board of Appeals erred in affirming the Examiner's rejection of claims 1 to 10 in the above-identified application under 35 U.S.C. 101. Thus, the Board of Appeals erred in holding, in effect, that (1) claims 1 to 10 in the above-identified application were drawn to an invention which is not one of the types of invention set forth in 35 U.S.C. 101 as patentable under the Statutes; (2) the present claims were drawn to the mathematical relationships recited in steps 2 and 3 of the present claims and (3) *In re Christensen*, C.C.P.A., 178 U.S.P.Q. 35 overruled the holding in *In re Waldbaum*, C.C.P.A., 173 U.S. P.Q. 430.

CONCLUSION

Notice is hereby given to the Commissioner that an appeal to the United States Court of Customs and Patent Appeals is being taken seeking to reverse the Board of Appeals decision

affirming the Examiner's rejection of claims 1 to 10 in the above-identified application under 35 U.S.C. 101 and its denial of a Request for Reconsideration of such decision.

Respectfully submitted,

By Frank J. Uxa
FRANK J. UXA,
Reg. No. 25,612,
Attorney for Appellant.

September 16, 1976.

REJECTED CLAIMS

1. A method for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons wherein said alarm limit has a current value of

$$Bo+K$$

wherein Bo is the current alarm base and K is a predetermined alarm offset which comprises:

(1) Determining the present value of said process variable, said present value being defined as PVL;

(2) Determining a new alarm base B_1, using the following equation:

$$B_1=Bo\ (1.0-F)+PVL\ (F)$$

where F is a predetermined number greater than zero and less than 1.0;

(3) Determining an updated alarm limit value which is defined as B_1+K; and, thereafter

(4) Adjusting said alarm limit to said updated alarm limit value.

2. The method of claim 1 wherein said process variable is a transient process variable.

3. The method of claim 1 wherein step 4 comprises automatically adjusting said alarm limit to said updated value.

4. The method of claim 3 wherein said process variable is a transient process variable.

5. The method of claim 3 wherein the value of at least one alarm limit on each of at least 10 process variables are updated.

6. The method of claim 5 wherein at least one of said process variables is a transient process variable.

7. The method of claim 1 wherein said process comprises petroleum distillate hydrocracking.

8. The method of claim 2 wherein said process comprises petroleum distillate hydrocracking.

9. The method of claim 3 wherein said alarm limit is adjusted to said updated value using electronic means.

10. The method of claim 6 wherein said process comprises petroleum distillate hydrocracking and said alarm limit is adjusted to said updated value using electronic means.

Filed U.S. Court of Customs and Patent Appeals, Oct. 29, 1976; George E. Hutchinson, *Clerk*.

In the United States Court of Customs and Patent Appeals

Patent Appeal No. 77-512

In re application of: Dale R. Flook.
Serial No.: 194,032.
Filed: October 29, 1971.
For: Method for Updating Alarm Limits.

Petition on Appeal

To the United States Court of Customs and Patent Appeals:

Your Petitioner, Dale R. Flook, a citizen of the United States, respectfully represents:

That your Petitioner is the original and first inventor of new and useful improvements relating to methods for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons.

That on October 29, 1971, in the manner prescribed by law, your Petitioner presented his application to the United States Patent and Trademark Office praying that a patent be issued to him for said invention.

That proceedings were had in said Office upon said application; that on May 19, 1976, and August 24, 1976, said application was erroneously rejected by the Patent and Trademark Office Board of Appeals and a patent for said invention was wrongfully refused your Petitioner. Specifically, said Board of Appeals erred in affirming the Patent Examiner's rejection of claims 1 to 10 in said application under Section 101 of Title 35, United States Code.

That on September 20, 1976, your Petitioner, pursuant to Section 142 of Title 35, United States Code, gave notice to the Commissioner of Patents and Trademarks of your Petitioner's appeal to this Honorable Court from said Commissioner's refusal to issue a patent to your Petitioner for said invention

upon said application as aforesaid and filing with said Commissioner, in writing, the specific reasons of appeal.

That your Petitioner has requested that the Commissioner of Patents and Trademarks furnish this Honorable Court with a certified transcript of the record and proceedings relating to said application for patent, including the Notice and reasons of appeal and has further requested the Commissioner of Patents and Trademarks to transmit said transcript to this Honorable Court no later than the maximum time provided for in Rule 4.1 of this Honorable Court.

That your Petitioner is filing the docketing fee in the amount of Fifty Dollars ($50.00) as required by Rule 5.15 of this Honorable Court; a check in the amount of Fifty Dollars ($50.00) made payable to The Clerk, U.S. Court of Customs & Patent Appeals to cover said fee, being attached hereto.

WHEREFORE, your Petitioner prays that his appeal may be heard upon and for the reasons assigned therefor to the Commissioner as aforesaid and that said appeal may be determined and the decision of the Commissioner be reversed that justice may be done in the premises.

Respectfully submitted,

DALE R. FLOOK,
By Frank J. Uxa
FRANK J. UXA,
Attorney for Petitioner.

October 14, 1976.
400 East Sibley Boulevard
Harvey, Illinois 60426
Area Code 312 ED 3-3000

Filed U.S. Court of Customs and Patent Appeals, Oct 29 '76;
George E. Hutchinson, CLERK.

CERTIFICATE OF SERVICE

It is hereby certified that a copy of the foregoing PETITION ON APPEAL has this day been sent by first class mail, postage prepaid, to the Office of the Solicitor, United States Patent and Trademark Office, Washington, D.C. 20231.

DALE R. FLOOK,
By Frank J. Uxa
FRANK J. UXA,
Attorney for Petitioner,
312 ED 3-3000.

October 14, 1976.

U.S. Department of Commerce, United States Patent Office

October 29, 1976.
(Date)

THIS IS TO CERTIFY that the annexed is a true copy from the records of this office of Certain Requested Documents, said Documents being the Record for the United States Court of Customs and Patent Appeals, in the matter of the Pending Application of Dale R. Flook.

Serial Number 194,062

[Filed October 29, 1971]

METHOD FOR UPDATING ALARM LIMITS

[SEAL] By authority of the
Commissioner of Patents

G. V. DORSEY,
Certifying Officer.

Supreme Court of the United States

No. 77-642

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS, PETITIONER

v.

DALE R. FLOOK

[Filed January 16, 1978]

Order Allowing Certiorari

The petition herein for a writ of certiorari to the United States Court of Customs and Patents Appeals is granted.

Supreme Court, U. S.
FILED
DEC 22 1977
MICHAEL RODAK, JR., CLERK

IN THE

Supreme Court of the United States

OCTOBER TERM, 1977.

No. 77-642

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS,

Petitioner,

vs.

DALE R. FLOOK,

Respondent.

BRIEF IN OPPOSITION TO PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

FRANK J. UXA, JR.,
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Harvey, Illinois 60426,
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IN THE

Supreme Court of the United States

OCTOBER TERM, 1977

No. 77-642.

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS,

Petitioner,

vs.

DALE R. FLOOK,

Respondent.

BRIEF IN OPPOSITION TO PETITION FOR WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

Respondent, Dale R. Flook, opposes the petition for writ of certiorari to the United States Court of Customs and Patent Appeals.

QUESTION PRESENTED.

Petitioner's statement of the question presented for review is in error. As stated by the Court below, "the issue in this case is whether a claim to a process which *uses* an algorithm to modify a conventional manufacturing system is statutory subject matter under *Gottschalk* v. *Benson*, 409 U. S. 63, 93 S. Ct. 253, 34 L. Ed. 2d 273, 175 U. S. P. Q. 673 (1972) and *Christensen, supra*". *Application of Flook*, 559 F. 2d 21, 22 (C. C. P. A. 1977) (emphasis in original).

ARGUMENT.

The United States Court of Customs and Patent Appeals in a unanimous decision reported at 559 F. 2d 21 (P.[1] Appendix A), reversed the Patent and Trademark Office Board of Appeals and held the subject matter claimed in respondent's patent application (R.[2] 7) to be patentable under 35 U. S. C. § 101. Petitioner, the Acting Commissioner of Patents and Trademarks, seeks review by this Court on writ of certiorari. 28 U. S. C. § 1256. Since the opinion below is in agreement with this Court's previous decisions and since there are no other special and important reasons for review on writ of certiorari, the Petition should be denied.

This case involves patent claims directed to a novel, unobvious and useful method for adjusting alarm limits on process variables associated with a catalytic hydrocarbon conversion process. Mathematical relationships are used in the intermediate steps of respondent's method to determine updated values which are then used in adjusting the alarm limits. When an alarm limit on a process variable is exceeded, a signal is given, *e.g.*, sounded, to warn of possible danger to the hydrocarbon conversion process. Thus, the present invention provides for improved safety and efficiency in the operation of a catalytic hydrocarbon conversion process. As the Patent Examiner agreed (R. 39), this invention is clearly a new and unobvious process which is also useful in the technological arts as called for in 35 U. S. C. § 101[3] and the Constitution.[4]

1. "P." refers to the Petition for Writ of Certiorari to the United States Court of Customs and Patent Appeals filed in the present case.

2. "R" refers to the printed record filed in the Court of Customs and Patent Appeals. Petitioner has indicated that a copy of this record has been lodged with the Clerk of this Court.

3. *Application of Musgrave*, 431 F. 2d 882 (C. C. P. A. 1970); *Application of Waldbaum*, 457 F. 2d 997 (C. C. P. A. 1972).

4. Article I, Section 8, Clause 8 of the Constitution of the United States is as follows:

(Footnote continued on next page.)

Petitioner, focusing solely on the mathematical relationships useful in part to aid in defining respondent's method, proposes a question to this Court which is not presented by the facts of this case. Petitioner's primary contention is that respondent is seeking to patent the mathematical relationships useful in the present method in direct conflict with this Court's decision in *Gottschalk* v. *Benson, et al.*, 409 U. S. 63 (P. 11 and 12).

However, the Petitioner's position is without basis in fact. Respondent does not seek to patent, *i.e.*, wholly pre-empt, the mathematical relationships included in the overall claiming of the invention. Rather, the technologically useful method applies such relationships to modify the operation of a catalytic hydrocarbon conversion process, *e.g.* to improve process safety and efficiency.

This Court in *Benson*, 409 U. S. at 72, came down to the following "nutshell" holding:

> "It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting BCD numerals to pure binary numerals were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly preempt the mathematical formula and in practical effect would be a patent on the algorithm itself."

The Court below, applying the holding of *Benson* to the facts of the present case stated, 559 F. 2d at 23, as follows:

> "We must then consider whether *Benson* itself excludes the present claims from patentability. *Benson's* proscription was limited by its words to claims which involve a 'mathematical formula' and which 'would wholly pre-empt the mathematical formula.' 409 U.S. at 72, 93 S.Ct. at 257, 175

(Footnote continued from preceding page.)

> The Congress shall have the Power * * * To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries * * *

> U.S.P.Q. at 676. The present claims do not pre-empt the formula or algorithm contained therein, because solution of the algorithm contained therein, because solution of the algorithm, per se, would not infringe the claims. Thus, *Benson's* holding does not render the claims before us unpatentable. The decision of the board is reversed."

Petitioner argues that the holding in the present case is the latest in a series of rulings by the United States Court of Customs and Patent Appeals which rest on a strained interpretation of *Benson*. However, *Benson* holds that patent claims which wholly pre-empt algorithms are unpatentable under 35 U. S. C. § 101. Here respondent merely uses mathematical relationships in the intermediate steps of a claimed method to modify the operation of a hydrocarbon conversion process. No total pre-emption of these mathematical relationships is sought, and none is granted. Thus, the Court below has correctly applied *Benson* in holding respondent's claims patentable under 35 U. S. C. § 101.

In addition, contrary to the implication raised by Petitioner, the Court below is, in fact, refusing to grant patents based on its interpretation of *Benson*. See for example, *Application of de Castelet*, 562 F. 2d 1236 (C. C. P. A. 1977) and the cases cited therein.

Petitioner quotes from the dissent of Judge Rich in *Application of Chatfield*, 545 F. 2d 152 (C. C. P. A. 1976), certiorari denied *sub nom. Dann* v. *Chatfield*, No. 76-1559, October 3, 1977, regarding the importance of settling the question of computer software patentability (P. 10, footnote 10). However, given the present facts, Judge Rich joined in the *unanimous* decision of the Court below to hold that respondent's method is patentable under 35 U. S. C. § 101 in view of *Benson*. The unanimity of the decision below provides a still further indication that this holding is fully consistent with this Court's decision in *Benson*. Additionally, the question presented by this case does not provide any other special and important reasons for granting review on writ of certiorari as required by Rule 19(1) of this Court.

Petitioner contends that the "point of novelty" of respondent's method is the recited mathematical relationships which by themselves are not patentable under 35 U. S. C. § 101 and, therefore, Petitioner contends that respondent's whole method is unpatentable under 35 U. S. C. § 101. Such a restrictive interpretation of the entire claim, by focusing only upon a single element of it, is improper and has been discredited. For example, in *Application of Bernhart and Fetter*, 417 F. 2d 1395 (C. C. P. A. 1969), the United States Court of Customs and Patent Appeals expressly held that the "point of novelty" contention was not correct under the Patent Act and the case law as developed to that time. No subsequent decisions can be cited to the contrary. Petitioner inappropriately notes only this Court's decisions in *Benson* and in *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U. S. 127, which do not address a "point of novelty" position.

Petitioner states that *Benson* holds that "processes applying scientific principles or ideas are to be upheld only when: (1) the process was carried out with a specific apparatus devised to implement the newly-discovered idea, and (2) the claim to a monopoly was confined to a specific end-use or field of art or technology". (P. 15). These restrictive generalities are in no way specified by this Court's precise holding in *Benson* that subject matter which wholly pre-empts a mathematical formula and is, in practical effect, a patent on the algorithm itself is not statutory under 35 U. S. C. § 101. Respondent's method does not wholly pre-empt any mathematical relationships merely because such relationships are defined and used in the claimed methods. Instead, respondent claims as his method invention a novel and useful sequence of steps for controlling at least one variable in a catalytic chemical conversion process, by determining an updated alarm limit for it through the performance of certain specified mathematical calculations, and by then adjusting the alarm limit to its new value.

CONCLUSION.

The Petition should be denied for failure to present any question appropriate to the granting of a petition for writ of certiorari as required under Rule 19 of this Court. The question presented by this case has been properly answered by the unanimous decision of the Court below in full and complete agreement with this Court's decision in *Gottschalk* v. *Benson et al.*, 409 U. S. 63. Respondent submits that no conflict exists between the present case and any of the Court's decisions, in particular, *Benson*. Further, the question presented by this case involves no other special or important reasons for review on Writ of Certiorari as required by Rule 19(1) of this Court. The Petition should be denied.

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No. 77-642

In the Supreme Court of the United States

OCTOBER TERM, 1977

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS, PETITIONER

v.

DALE R. FLOOK

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF FOR THE PETITIONER

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In the Supreme Court of the United States

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v.

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ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF FOR THE PETITIONER

OPINIONS BELOW

The opinion of the Court of Customs and Patent Appeals (Pet. App. A, 1a–5a) is reported at 559 F. 2d 21. The initial opinion and opinion on request for reconsideration of the Patent and Trademark Office Board of Appeals (Pet. App. B, 6a–10a, and Pet. App. C, 11a–13a) are unreported.

JURISDICTION

The decision of the Court of Customs and Patent Appeals was rendered on August 4, 1977. The peti-

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tion for a writ of certiorari was filed on November 2, 1977, and was granted on January 16, 1978. The jurisdiction of this Court rests on 28 U.S.C. 1256. *Gottschalk* v. *Benson*, 409 U.S. 63; *Dann* v. *Johnston*, 425 U.S. 219.

QUESTION PRESENTED

Whether a method is patentable subject matter under 35 U.S.C. 101 when the patent applicant's sole inventive contribution consists of a mathematical algorithm to be conventionally implemented, preferably in a standard general-purpose digital computer, and applied to control existing manufacturing processes.

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

Article I, Section 8, clause 8, of the Constitution of the United States provides:

> The Congress shall have Power * * *
> * * * * * *
> To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries; * * *.

35 U.S.C. 101 provides:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof may obtain a patent therefor, subject to the conditions and requirements of this title.

STATEMENT

Respondent, an employee of Atlantic Richfield Company, applied for a patent on a "Method for Updating Alarm Limits" on manufacturing conditions that are monitored in the catalytic conversion of hydrocarbons (App. 3A, 15A, 16A).[1] In these commercial chemical processes, various "process variables" (such changeable conditions as heat, pressure, and reactant and product flow rates) must be maintained within specified ranges. Control systems are employed to monitor and regulate such process variables, and typically include general-purpose digital-computer equipment. These control systems periodically measure the values of the various process variables, compare these values to specified outer permissible limits, and alert an employee (usually through the sounding of an alarm) to take corrective action whenever the value of any of the process variables falls above or below those permissible limits (which are therefore called "alarm limits") (App. 3A–4A). Respondent's claimed invention provides a procedure for calculating the alarm-limit values, based on a mathematical algorithm.

In previous control systems, the alarm limits were calculated for each process variable and then fixed at

[1] Such hydrocarbon conversion processes commonly occur in industries such as petroleum refining and petrochemical processing. See, *e.g.*, App. 3A. Apparently, hydrocracking of petroleum distillates into gasoline is the most important application that respondent envisions. See App. 8A–10A, 63A–64A (claims 7, 8. 10).

the calculated values. For example, the alarm limit might be fixed at x units above or below the average expected value of the process variable. However, in normal catalytic chemical processing, where the values of at least some process variables can be expected to change, these values in some cases will approach or even exceed the originial alarm-limit values, as the process is carried out. To accommodate such changing conditions, the fixed alarm limits had to be periodically adjusted manually (App. 4A). In respondent's method, however, the alarm-limit values are periodically recomputed and "updated" to adjust for the expected changes in the values of process variables (App. 4A–5A).

Respondent's method accomplishes this periodic recomputation of the alarm-limit values by providing a mathematical formula or algorithm for calculating new ("updated") alarm-limit values based on prior values of the process variables.[2] For each process variable, the algorithm specifies that a pre-determined "alarm offset" constant be added to an "alarm base," which is a function of the present value of the process variable and all of its previously-measured values.[3]

[2] The algorithm is set forth in claim 1 of the patent application (App. 14A), and explained and illustrated in the specification (App. 5A–6A, 10A–13A). A detailed analysis of the equations that compose the algorithm is presented in the Appendix to this brief, *infra*, pp. 3A–6A.

[3] The alarm base is similar to an average, but one in which recent measurements are given more weight than earlier measurements. An example of an alarm base function would be the sum of the following: half of the present value of the process variable, plus one-fourth of the previously-measured value, plus one-eighth of the value measured before that, plus one-sixteenth of the value measured before that, and so on. See App., *infra*.

The sum of these numbers is the updated alarm-limit value for the process variable. As chemical processing continues, the algorithm is repeatedly carried out to calculate subsequent updated alarm-limit values. The dependence of the alarm-limit values on the present and previous values of the process variable allows expected changes in the process variable value to occur as the process continues without activating the alarm. In brief, respondent's method provides a formula that permits a control computer to recalculate alarm limits based on previous changes in the process variable.

Respondent's method does not specify the precise value of the alarm-offset constant or of the weighting factor that determines the relative weight to be accorded the present and past values of the process variable in calculating the alarm base function (App., *infra*). Rather, the user of the system must select the appropriate values for the constants to be employed in the formula. These values are determined empirically on the basis of the user's past experience with the process and process variable in question (App. 6A). Respondent states that the appropriate values can be arrived at by "routine experimentation" (*ibid.*). Similarly, the user must determine the frequency with which the process variables are to be measured and new alarm limits are to be calculated (*ibid.*).

Respondent claimed the general method (however implemented) for updating alarm-limit values on chemical hydrocarbon-conversion process variables by using this algorithm (see claim, App. 63A [4]), the

[4] Respondent's claim 1 breaks the method down into the following four steps: (1) measurement of the present value of the

method as implemented automatically (see claims 3–6, 9, and 10, App. 63A–64A), and, most specifically, the method as implemented electronically for hydro-cracking petroleum distillates (as in gasoline production) (see claim 10, App. 64A).[5] Under some claims (see claims 1, 2, 7, 8; App. 63A–64A), the method may be performed manually, with "'pencil and paper' calculations" (see App. 18A), but the application describes the use of electronic (*e.g.*, digital-computing) means as the preferred embodiment of the method (App. 7A).[6] In this embodiment, a conventional general-purpose digital computer that can be used to monitor a process (and generate a signal to set off an alarm when necessary) is programmed to perform respondent's algorithm, so that updated alarm-limit values are calculated according to the formula set forth in respondent's claim 1 (App. 41A–42A; App., *infra*.).

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process variable; (2) calculation of the "alarm base" value; (3) addition of the alarm-base value to the alarm-offset constant; and (4) adjustment of the alarm limit to reflect the newly-calculated value (App. 63A).

[5] The claims all depend on claim 1 but vary in different ways from it and one another by reason of greater specificity. Claim 6, for example, covers the method of claim 1 as implemented automatically to update values of alarm limits for at least 10 process variables, at least one of which is a "transient" (*i.e.*, changing) process variable. Claim 1 is the most sweeping and claim 10 is the narrowest and most specific.

[6] None of the claims, however, limits the method to performance by general purpose digital computers. Rather, the only claims containing limitations to electronic equipment (claims 9 and 10) specify only that the automatic operation of the method be accomplished "using electronic means" (App. 64A).

It is not disputed that, aside from the novel algorithm for computing updated alarm-limit values, every aspect of respondent's claimed invention is conventional and well-known in the art. Respondent stated that the chemical processes involved in catalytic conversion of hydrocarbons are "well-known," as are the operating conditions and catalyst compositions employed (App. 8A). He also stated that chemical process control systems already exist in which automatic equipment monitors the process variables and sets off an alarm if the acceptable limits on the variables are exceeded (App. 7A–8A, 12A, 21A–24A), and in which the user recomputes and readjusts these limits manually to conform them to changing operating conditions (App. 4A). Apparatus that can automatically carry out respondent's method—"automatic equipment involving a digital computer which can be used for automatic process monitoring-alarming" (App. 42A)—is "conventional and well-known" (App. 8A, 21A–24A, 30A–33A, 41A–45A). Automatic adjustment of alarm limits according to a programmed definition is conventional (App. 43A). Even the determination of the values of the constants used in respondent's updating method is made according to well-known principles regarding the normal behavior of the chemical process (App. 5A–6A, 8A).

The patent examiner found that "the only difference between [respondent's] claims and the prior art is in the mathematical formula involved in updating the value of an alarm limit" (App. 18A, 26A; see

App. 47A–48A). The computer programming of this mathematical formula for use in conventional electronic equipment is, respondent states, "well within the ordinary skill of the art" (App. 42A). Finally, as the examiner noted, such automation produced "no unexpected results" (App. 48A–49A). The patent examiner rejected all of respondent's claims as unpatentable under 35 U.S.C. 101 (App. 26A),[7] and stated that a patent on the claimed method "would in practical effect be a patent on the formula or mathematics itself" (App. 47A).

On appeal, the Board of Appeals of the Patent and Trademark Office (the "Board") sustained the rejection. Because respondent "proposes to use conventional automatic alarm adjusting equipment" to implement his claimed invention, the Board concluded, any inventive contribution that he made is only in "the formulas or algorithm [that he] disclosed and claimed" (Pet. App. B, 9a), and thus is unpatentable under the decision in *Gottschalk* v. *Benson*, 409 U.S. 63. Respondent requested reconsideration of the Board's decision, arguing that his claims are unlike Benson's. He contended that his claims do not cover a mathematical algorithm, because the final recited step of his method (step 4 of claim 1[8]) is not

[7] Initially, the examiner had also rejected respondent's claims to his method as implemented automatically (claims 3–6, 9, and 10) as insufficiently disclosed (35 U.S.C. 112). The examiner later withdrew this rejection (App. 34A–35A), however, and it was thus not in issue before the Board of Appeals or the court below, nor is it in issue now.

[8] See note 4, *supra*.

the solution of a mathematical equation, but rather the application of such a solution (made in the preceding steps) to a method of regulating a chemical process (App. 56A–58A). The Board rejected this attempted distinction as "specious" and reaffirmed its initial decision (Pet. App. C, 11a–13a).

The Court of Customs and Patent Appeals reversed, finding that respondent's claims "do not preempt the formula or algorithm contained therein, because solution of the algorithm, per se, would not infringe the claims" (Pet. App. A, 5a). The court ruled that the proscription on patentability in *Benson, supra,* is limited to situations in which the claims wholly pre-empt a mathematical formula or algorithm. The court therefore held that *Benson* did not govern this case, because the instant claims include a recitation that "materially limits [them] to a scope less than the mere act of solving an algorithm" (*id.* at 4a–5a).

SUMMARY OF ARGUMENT

Respondent seeks a process patent on a method for updating alarm limits on process variables involved in hydrocarbon conversions. The only advance over the prior art contained in respondent's method is the mathematical algorithm it utilizes. It is axiomatic that an abstract idea such as a mathematical formula is not itself patentable. Moreover, a process or method that incorporates a new abstract principle in a way that is conventional in light of existing technology is not patentable. Instead, to be patentable, embodiments of scientific or mathematical principles must be imple-

mented in an inventive manner. The rationale underlying this limitation on patentability is that the public has the right not only to the free exchange of abstract intellectual concepts, which are "the basic tools of scientific and technological work" (*Gottschalk* v. *Benson,* 409 U.S. 63, 67), but also to the benefits of the use of those concepts in ways that are entirely predictable. It is only the inventive use of a mathematical principle that warrants patent protection.

In *Benson,* this Court denied patent protection to a method that had no end-use limitations, noting that a patent "would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself." 409 U.S. at 72. Although respondent's claims extend only to the use of the algorithm in establishing alarm limits for process variables in hydrocarbon conversions, the method remains a set of mathematical equations to be used in arriving at a number; the fact that the number so derived has a particular practical application does not change the fact that the claimed invention is merely a way to calculate a number, so that, as in *Benson,* the issuance of the patent would in practical effect confer dominion over the equations themselves.

Because respondent's method contains nothing more than an algorithm applied in a conventional manner to existing technology, it is not patentable under 35 U.S.C. 101. Any extension of the scope of that Section is a matter for consideration by Congress, rather than the courts.

ARGUMENT

I. THE PATENT STATUTE AND THIS COURT'S DECISIONS INTERPRETING IT DO NOT PERMIT AWARD OF A MONOPOLY OF RESPONDENT'S CLAIMED METHOD

The patent statute (35 U.S.C. 101) permits a patent to be issued only to one who "invents or discovers" a new and useful advance that comes within one of four enumerated concrete classes of statutory subject matter: machines, articles of manufacture, composition of matter, and processes for making or using one of the foregoing.[9] Respondent claims a patent on a process—a new method for updating alarm limits on process variables involved in hydrocarbon conversion. Respondent's process is designed to be carried out in existing computers long in use, and to monitor conventional chemical processes in a manner virtually identical to that previously utilized. Only the particular mathematical steps that respondent utilizes are advances over the prior art (see, *e.g.,* App. 41A–45A).

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[9] The particular language involved here is quite old, dating from the original Patent Act of 1790, Section 1, 1 Stat. 109–110:

"That upon the petition of any person or persons * * * that he, she, or they, hath or have invented or discovered any useful art, manufacture, engine, machine, or device, or any improvement therein * * * it shall * * * be lawful to * * * cause letters patent to be made out * * *."

The term "process" was substituted for "art" in the 1952 Code; "process" is defined to mean "process, art, or method." 35 U.S.C. 100(b).

A. ABSTRACT IDEAS ARE NOT PATENTABLE

It is axiomatic that respondent's algorithm, consisting simply of mathematical formulae (App., *infra*), is not itself patentable. It is long settled that an abstract idea, even if it is an important advance in human thought, is not patentable. Thus patents will not issue for scientific principles, phenomena of nature, or mathematical formulae or algorithms. See, *e.g.*, *Gottschalk* v. *Benson,* 409 U.S. 63 (mathematical algorithm); *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.,* 333 U.S. 127 (phenomenon of nature); *Rubber-Tip Pencil Co.* v. *Howard,* 20 Wall. 498, 507 (mechanical principle); *O'Reilly* v. *Morse* (the *Telegraph* case), 15 How. 62 (scientific principle).[10] Similarly, methods of doing business are unpatentable. *Joseph E. Seagram & Sons, Inc.* v. *Marzall,* 180 F. 2d 26, 28 (C.A. D.C.); *Hotel Security Checking Co.* v. *Lorraine Company,* 160 Fed. 467, 469 (C.A. 2).

These long-standing exclusions from statutory patent coverage stem from the constitutional limitation on Congress' authority to grant monopoly protection to only those "Discoveries" that "promote the Progress of Science and useful Arts" (Article I, Section 8, clause 8). See *Graham* v. *John Deere Co.,* 383 U.S. 1, 5–6. Issuance of patents on abstract ideas (however novel) would impede that progress more than advance it, because granting such monopolies would, as this Court stated in *Benson, supra.,* 409 U.S.

[10] See also *Le Roy* v. *Tatham,* 14 How. 156, 174–175; *Mackay Radio & Tel. Co.* v. *Radio Corp.,* 306 U.S. 86, 94; *Risdon Iron and Locomotive Works* v. *Medart,* 158 U.S. 68.

at 67, deny the public the benefit of "the basic tools of scientific and technological work."

B. USE OF AN ABSTRACT IDEA IS NOT PATENTABLE ABSENT INVENTION IN THE APPLICATION OF THE IDEA

Respondent does not contend that his algorithm is itself patentable; instead, he claims that his method "merely uses mathematical relationships in the intermediate steps of a claimed method to modify the operation of a hydrocarbon conversion process" (Br. in Opp. 4). But for the same reasons that abstract ideas, "the basic tools of scientific and technological work" (*Benson, supra,* 409 U.S. at 67), are not patentable, the use of such ideas (or formulae) in conventional ways to solve practical problems is not patentable. An unpatentable abstract idea does not become patentable simply because it is incorporated into a process that is useful, but entirely predictable in light of the prior art.

This limitation is reflected in this Court's precedents and 35 U.S.C. ~~1001~~ 101, codifying them.[11]

[11] As this Court implicitly recognized in *Benson, supra,* by its reliance on early cases, enactment of the 1952 Patent Code did not change the prior law. See *Aro Manufacturing Co.* v. *Convertible Top Co.,* 365 U.S. 336, 347 n. 2 (Black, J., concurring) (noting that, immediately before the vote in the Senate, the Chairman of the Judiciary Committee stated, in response to the question whether "the bill change[s] the law in any way or only codif[ies] the present patent laws," that the bill "codifies the present patent laws"). As noted *supra* at n. 9, Congress has not altered the statutory language requiring "invention or discovery" in the section enumerating the classes of patentable subject matter since the inception of the patent system. Nor did the addition of 35 U.S.C. 103, defining and codifying the standard for "non-obvious

256-313—78——3

Section 101 requires that a patent applicant "invent or discover [a] * * * process * * * or * * * improvement thereof" to be entitled to a patent for a claimed development. Under this standard, it is not enough that a process be newly "discovered" in the broadest ordinary sense of the term. Rather, the patent law requires that a patentable discovery be of the kind that warrants the imposition of a monopoly grant. Respondent's process is not a discovery of that kind because the mathematical algorithm, the sole arguably inventive feature,[12] is neither concretely embodied by means of a specifically devised apparatus, nor otherwise applied in a novel and inventive manner to the specific use claimed.

1. Concrete embodiment in a specifically devised apparatus

In *Gottschalk* v. *Benson, supra,* reviewing "the requirements of our prior precedents" on the patent-

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subject matter," change the existing body of law denying patentability for abstract ideas. Section 103 was enacted to codify the law regarding the degree of advance over prior art that would justify a monopoly grant, not to deal with the patentability of ideas or abstractions or of processes incorporating them.

In any event, since the Board concluded that respondent's claims did not contain patentable subject matter as defined in Section 101, it did not reach the question whether the process was barred from patentability by Section 103. Therefore, the question whether the claim embodied a sufficient advance over the prior art to merit a patent was not before the court below and is not before this Court. Cf. *Dann* v. *Johnston*, 425 U.S. 219.

[12] The examiner evidently concluded that respondent's mathematical formulae were novel (App. 26A, 48A–49A). We do not contest this conclusion.

ability of methods (409 U.S. at 67–71), this Court found that patents for processes applying scientific principles or ideas have been upheld only when: (1) the process was carried out with a specific apparatus devised to implement the newly-discovered idea, and (2) the claim to a monopoly was confined to a specific end-use or field of art or technology.[13] The method that Benson sought to patent was a mathematical algorithm for changing binary-coded decimal ("BCD") information into pure binary information. This was presumably a meritorious and novel idea, useful in the Bell Company's telephone switchboard systems as well as in many other applications. But Benson's claims did not meet either of the two requirements of patentability for such methods: the claims were limited neither (1) to any category of application that was narrower than the whole field of performing BCD-to-binary conversion in the course of "data processing," nor (2) to use in any specific new machinery devised to practice Benson's method or to any more specific old machinery than general-purpose digital computers. In effect, Benson's claimed invention

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[13] The Court considered such apparatus and end-use limitations essential to placing reasonable boundaries on the scope of the monopoly grant. In so ruling the Court found that in cases such as that involving a process for converting fats into glycerine, specificity as to ingredients, temperatures, and pressures supplied the requisite boundaries to the monopoly granted (409 U.S. at 69–70). Such cases are not pertinent to *Benson* or the present case, in which the claimed methods are not particular methods for accomplishing specific physical transformations of one substance into another.

was a method consisting of a new series of mathematical steps to accomplish BCD-to-binary conversion, by means of a conventional general-purpose digital computer.

The Court suggested that "the requirements of our prior precedents" indicate that "a process patent must either be tied to a particular machine or apparatus or must operate to change articles or materials to a 'different state or thing' " (409 U.S. at 71).[14] It found it unnecessary to rely on this rule in order to decide the case before it, in light of the conceded principle that ideas themselves are not patentable. Issuance of the patent in *Benson* was accordingly improper because it would "wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself" (409 U.S. at 72).

Respondent's claimed invention falls squarely within the rule of *Benson*. Respondent's method does

[14] The court noted (409 U.S. at 68–69) that its earlier cases emphasize the importance of the embodiment of the mathematical or abstract idea in a specific apparatus. Thus, in *O'Reilly* v. *Morse* (the *Telegraph* case), 15 How. 62, the Court allowed Morse's claim for a process using the principle of electromagnetism for communicating information by means of a specified novel apparatus Morse had devised to produce signals for telegraphic use. But the Court denied Morse's broader claim for the general method of communicating by means of electromagnetism, because that would impermissibly extend Morse's patent monopoly to cover a whole scientific principle, regardless of the apparatus utilized to carry out the method and scientific principle. In *The Telephone Cases*, 126 U.S. 1, the Court allowed Bell's method claim for telephonic use of electric current, only because it was limited to the method as carried out with the "magneto and variable resistance" (*id.* at 538) mouth-piece devices that Bell had developed.

nothing more than provide a different mathematical procedure for calculating limiting values on variables to be used in chemical processing, just as Benson's method provided a different mathematical procedure for calculating the pure binary equivalents of BCD numbers to be used in data processing. Neither method involves specific apparatus newly devised to implement the mathematical procedure. Rather, respondent's method, like Benson's, involves computing apparatus that is old in the art: respondent expressly admitted (*e.g.*, App. 41A–45A) that the mathematical algorithm can be, and indeed is designed to be, "carried out in existing computers long in use" for monitoring and regulating chemical processes (cf. *Benson, supra,* 409 U.S. at 67).[15] Only the particular mathematical steps that respondent utilizes are advances over the prior art.

To be sure, respondent's method is more limited than Benson's to a specific end-use, art, or technology,

[15] Indeed, some of respondent's claims are so broad that they need not be performed by electronic digital-computer means; rather, they can be performed manually (as the examiner found, App. 18A), or on a hand-held pocket calculator. Anyone using the mathematical concepts of respondent's algorithm to calculate alarm-limit values for these chemical process variables (and then using the numbers for "updating") would infringe respondent's claim 1, regardless of the means by which the calculation is made.

Moreover, claim 1 is not even a method of making or using a machine, article of manufacture, or composition of matter. It is simply a method of calculating a number (termed an "alarm limit"). Similar objections apply to at least claims 2, 7, and 8. Methods of calculating numbers, regardless of what the numbers are then used for, are not patentable. *Gottschalk* v. *Benson*, *supra*.

since respondent limits his claims to use in calculating alarm-limit values "involved in" hydrocarbon conversion (claim 1, App. 63A). But respondent's method remains a method of solving mathematical equations to arrive at a number; the fact that it may have a practical application in controlling chemical processing (or in other ways that respondent chose not to claim) does not change the fact that the claimed invention is merely a way to calculate a number. In our view, for example, the result would have been the same in *Benson* had the claim there been limited to use in conventional telephone switchboard systems. See note 14, *supra* (discussing the *Telephone* and *Telegraph* cases).

The court below was accordingly incorrect in distinguishing *Benson* on the ground that the claims here do not *wholly* pre-empt the mathematical equation, because the calculated numbers are used to 'update' alarm limits, which in turn can be used to monitor conditions in conventional manufacturing systems. Based on this alleged distinction, the court held that "solution of the algorithm, *per se,* would not infringe the claims" (Pet. App. A, 5a).[16] But such a distinction is, as the Board below held, "specious" (Pet. App. C, 12a). Respondent's recitation of a last step that conventionally applies the result of a set of steps describing a mathematical calculation adds nothing that makes the algorithm a patentable invention. It is as if respon-

[16] The claims literally cover both (1) the algorithm used to calculate alarm-limit values and (2) the adjustment of the alarm limits to reflect the newly calculated values (see note 4, *supra.*)

dent were trying to patent the Pythagorean Theorem as part of a method, by adding a final step that suggested applying the solution of the equation to surveying. Such a last step is not an integral part of a new invention, but rather the non-inventive application of a mathematical result to existing technology;" that fact is not changed by the facile device of so drafting a claim that it places an abstract mathematical algorithm within or before a recitation of steps conventionally performed in existing technology. Cf. *Application of Christensen,* 478 F. 2d 1392 (C.C.P.A.).

2. Novel and inventive use

Even if the end-use limitations in respondent's claims were sufficient to distinguish his application from the one involved in *Benson,* he would still not be entitled to a patent under Section 101. To merit monopoly protection, it is not sufficient that a claim embody a concrete, tangible application of a mathematical or scientific principle; it must also extend beyond the routine, conventional, or uninventive applications that follow once the applicant possesses the idea. Thus in *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.,* 333 U.S. 127, the patentee had discovered the law of nature that particular strains of bacteria used to inoculate certain plants did not have an inhibitory effect on one another.[18] He then applied this discovery

[17] It is undisputed that the use of calculated alarm-limit values to monitor chemical process variables is old in the art. See *supra* at p. 7.

[18] The patentee "discovered" the law in the sense that he was first to recognize and utilize it.

by preparing a new mixture of bacteria culture. Despite the fact that this new mixture was a concrete product, newly devised to be employed for a specific end-use in a specific art or technology, the Court held that it nevertheless "fell short of invention within the meaning of the patent statutes" (*id.* at 131). The reason, as the Court explained, was that there was nothing inventive in preparing the mixture of bacteria to carry out the discovery, once the scientific discovery (unpatentable in itself) was grasped—"however ingenious the discovery * * * may have been, the application of it is hardly more than an advance in the packaging of the inoculants" (*ibid.*). In *Benson, supra,* 409 U.S. at 67–68, the Court held that the principle of *Funk* applies to process claims (like those at issue in both *Benson* and the present case) as well as to claims for "products" (involved in *Funk*).

Similarly, in an analogous chemical processing case, *Davison Chemical Corp.* v. *Joliet Chemicals, Inc.,* 179 F. 2d 793 (C.A. 7), certiorari denied, 340 U.S. 816, the patent applicant had "discovered" that the higher the temperature of the wash water used in the process for manufacturing silica gel, the lower the density of the final product. The court found that this principle was new, but that its application to the old process of silica gel manufacturing was not an invention warranting a patent monopoly, stating (*id.* at 795): "Discovery of a previously unknown law of operation, involved in no new method, has never been held to be

invention. The application of the law must be novel and inventive in character." [19]

Thus, regardless of the novelty of the basic scientific or mathematical principle, its application must also be inventive for the method or product to qualify for a patent grant.[20] Unless that test of inventiveness

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[19] See, to the same effect as *Funk* and *Davison*: *Armour Pharmaceutical Co.* v. *Richardson-Merrell, Inc.*, 396 F. 2d 70, 73–74 (C.A. 3); *National Lead Co.* v. *Western Lead Products Co.*, 324 F. 2d 539, 542 (C.A. 9); *Loew's Drive-In Theatres, Inc.* v. *Park-In Theatres, Inc.*, 174 F. 2d 547, 551–552 (C.A.), certiorari denied, 338 U.S. 822; *Templeton Patents, Ltd.* v. *J. R. Simplot Co.*, 336 F. 2d 261 (C.A. 9). In each of these cases the courts held that no patent should have been granted, because there was no invention in devising the claimed embodiment once the patentee had possession of the idea (which was unpatentable as such). See also *Rubber-Tip Pencil Co.* v. *Howard*, 20 Wall. 498, 507 (once patentee had idea of attaching eraser head to pencil, device to give idea effect involved nothing "new").

Respondent suggests (Br. in Opp. 5) that *Application of Bernhart*, 417 F. 2d 1395 (C.C.P.A.), holds that it is inappropriate to evaluate a claimed invention by determining whether its single element of novelty is patentable. But the principle enunciated by the court below in *Bernhart* is inconsistent with *Application of Christensen*, 478 F. 2d 1392, 1393 (C.C.P.A.), and with this Court's decision in *Funk* and the courts of appeals cases cited above.

[20] Similarly, claimed new combinations of old elements are patentable only if they are inventive, in the sense that the old elements must co-operate or co-act with one another in such a way that "the whole in some way exceeds the sum of its parts." *Great Atlantic and Pacific Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147, 152. See also *Lincoln Engineering Co.* v. *Stewart-Warner Corp.*, 303 U.S. 545, 549; *Reckendorfer* v. *Faber*, 92 U.S. 347, 356–358; *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.*, 396 U.S. 57, 61; *Deepsouth Packing Co.* v. *Laitram Corp.*, 406 U.S. 518, 521–522; *Sakraida* v. *Ag Pro, Inc.*, 425 U.S. 273, 282. No such claim is, or could be, made for respondent's claimed invention.

is continued, the public will be deprived of its right freely to utilize the ordinary applications that follow from abstract ideas and laws of nature.[21]

Respondent's application of the algorithm for determining alarm limits does not meet this test of inventiveness. The only inventive contribution in respondents's method is in the mathematical formula by which alarm-limit values are calculated. Once respondent worked out the equations or algorithm for computing the values, each aspect of the implementation of this algorithm was entirely straightforward and conventional—just as the aggregation of certain bacteria in *Funk, supra,* and the increase of the wash water temperature for making silica gel in *Davison, supra,* were straightforward and conventional implementations of the scientific principles involved in those cases.

Indeed, as the patent examiner stated, respondent's application of his idea contained "nothing new over the prior art [except] the formula or mathematics"

[21] Thomas Jefferson recognized a similar need to draw "a line between the things that are worth to the public the embarrassment of an exclusive patent, and those which are not" in his famous letter to Isaac McPherson, August 13, 1813, quoted in part in *Graham* v. *John Deere Co.*, 383 U.S. 1, 8–9 n. 2. Jefferson noted that the original patent board had developed the general rule that "* * * a machine of which we were possessed, might be applied by every man to any use of which it is susceptible, and that this right ought not to be taken from him and given to a monopolist, because the first perhaps had occasion so to apply it. Thus a screw for crushing plaster might be employed for crushing corncobs. And a chain-pump for raising water might be used for raising wheat: this being merely a change of application." VI *Writings of Thomas Jefferson* 182–184 (Washington ed.).

(App. 48A), and respondent's implementation of the idea by use of automatic computer equipment produced "no unexpected results" (App. 48A–49A). It follows, therefore, that however ingenious respondent's discovery of the mathematical equations may have been, its routine application by conventional means here "fell short of invention within the meaning of the patent statues" (*Funk, supra.* 333 U.S. at 131).

Since respondent's method involves neither a newly devised apparatus nor any other inventive manner of implementing an idea, there exists nothing to raise the innovative mathematical algorithm from the unpatentable status of an idea to the patentable status of an "invent[ion] * * * [of a] new and useful process" under 35 U.S.C. 101.

II. THIS COURT SHOULD NOT MODIFY ESTABLISHED PRINCIPLES GOVERNING PATENTABILITY

For the reasons noted above, the decision of the court below is inconsistent with well-settled judicial interpretation of the patent statute, which has existed in substantially the same form since its first enactment in 1790.[22] As this Court recognized in *Benson, supra,* 409 U.S. at 72–73, changing the standards of patentability to permit the patenting of computer applications of mathematical algorithms would raise serious problems "which only committees of Congress can manage, for broad powers of investigation are needed, including hearings which canvass the wide

[22] See note 9, *supra.*

variety of views which those operating in this field entertain".[23]

In any event, we submit that no such change is desirable. The public policy considerations underlying the present standard of patentability require that no patent monopoly be granted if its effect would be to withdraw the basic currency of technological and scientific progress from the public domain. See *Benson, supra,* 409 U.S. at 67.

Should the judgment below be upheld, substantial numbers of patents for noninventive computer applications of abstract ideas, mathematical in nature or otherwise, will issue.[24] This would have a debilitating effect on development of the computer industry [25] and

[23] This is particularly so since developing a system for effective review of such claims would impose a substantial additional burden on the Patent Office. If Congress determines that the Patent and Trademark Office should assume these responsibilities, it can provide the necessary resources.

[24] The Patent and Trademark Office estimates that approximately 600 to 900 applications for computer programming patents are now pending, and that approximately 450 such applications are now filed each year.

[25] The 1972 receipts volume for computer programming and other software services, defined as "establishments primarily engaged in providing services in computer programming, systems design and analysis, and other computer 'software'" (*Standard Industrial Classification Manual* (1972)), was almost $1 billion, out of a total data-processing services volume of $3.4 billion. United States Department of Commerce, *U.S. Service Industries in World Markets: Current Problems and Future Policy Development* A–96 (December 1976). This nearly $1 billion figure is exclu-

on all areas of the economy (of which chemical processing is only one example) in which computer technology can be applied.[26] The considerable added burden of time-consuming and expensive patent litigation in the courts would result in an additional social cost of any such revision of the basic standards of patentability. It is for Congress, rather than the courts, to determine whether additional protection for creative activity, beyond that afforded by the present patent laws, is desirable in this rapidly developing field and, if so, the form that protection should take.[27]

sive of the software services that integrated electronic computer manufacturers provide in conjunction with their computer systems. Compare *Standard Industrial Codes* 3573 ("Electronic Computing Equipment") and 7372 ("Computer Programming and Other Software Services") (1972). The estimated 1976 dollar volume for the software services industry was more than $1.7 billion. International Data Corporation, *1977 Annual Report: The Computer Services Industry* 9 (1977).

[26] One example of such a debilitating effect is that in order to avoid the "often staggering" expenses of defending a patent suit (see *Picard* v. *United Aircraft Corp.*, 128 F. 2d 632, 641 (C.A. 2) (concurring opinion of Frank, J.)) businessmen may pay tribute to specious patents of this type on the ground that royalty payments are a lesser evil than litigation expenses. See generally *Blonder-Tongue Laboratories, Inc.* v. *University of Illinois Foundation*, 402 U.S. 313, 334–336.

[27] A Commission to study changes in the copyright laws relating to computer programs was established by Pub. L. 93–573, Section 201, 88 Stat. 1873 (1974) (17 U.S.C. (Supp. V) 201 note). The Commission is to submit its final report by July 31, 1978. Pub. L. 95–146, 91 Stat. 1226 (1977).

CONCLUSION

For the foregoing reasons, the judgment of the Court of Customs and Patent Appeals should be reversed.

Respectfully submitted.

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APPENDIX

ANALYSIS OF RESPONDENT'S FORMULA

A chemical process such as hydrocarbon conversion involves various "process variables" (such as temperature) that may change as the process is performed.[1] For example, while it may be normal or even desirable for such a variable to increase slowly over time, too great or rapid an increase might jeopardize the successful completion of the process. As respondent stated in his specification (App. 3A–4A), in present control systems an "alarm limit" is therefore set for each process variable, which regulates the process by alerting the system operator (sounding an alarm) if the value of the process variable exceeds its specified limiting value. As represented in Figure 1, the alarm is set off if the value of the process variable (*"PVL"*) reaches the alarm-limit value (*"AV"*):

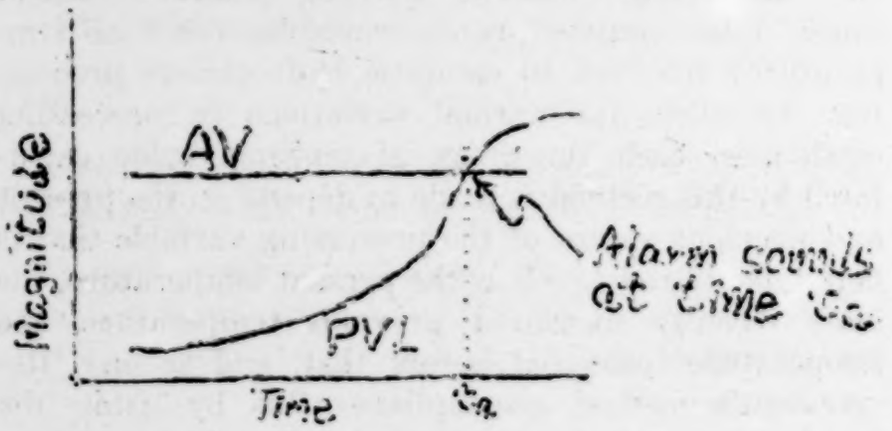

FIG. 1

[1] See *supra*, at p. 4.

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An alarm limit that is fixed at one value for the duration of the process is of limited utility, however, because regulation of a sensitive process may require that a process variable not exceed one value at one stage of the process, and another value at another stage (as in Figure 2); or that the value of a process variable increase at a particular rate (as in Figure 3):

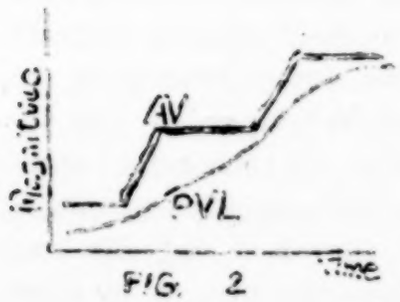


FIG. 2

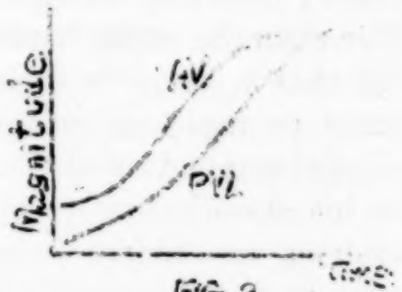


FIG. 3

Effective process regulation may require that such relationships be established between the alarm-limit values and the previous and present values of the process variable. Respondent seeks a patent on a method for calculating updated limiting values ("alarm limits") to regulate process variables (such as temperature) involved in catalytic hydrocarbon processing. To allow for normal variations in processing conditions, each successive alarm-limit value calculated by this method is made to depend on the present and previous values of the processing variable that is being monitored (such as the present temperature, the most recently measured previous temperature, the temperature measured before that, and so on). Respondent's method accomplishes this by using the basic mathematical concept of defining the new ("updated") alarm-limit value as a function of the past and present values of the process variable, and then periodically computing the function by "plugging in"

the newly measured values of the process variable. Such a function is known as a "smoothing function"; it is a kind of "average" that gives relatively greater weight to the more recent values of the process variable than to the earlier values.[2]

Respondent's method uses the following equations to arrive at an updated alarm-limit value (*"UAV"*) for a process variable (see App. 5A):

(Eq. 1) $$B_0 = CAV - K,$$

where CAV is the current value of the alarm limit, K is an empirically-determined alarm offset constant, and B_0 is the 'alarm base' (a function of initial and subsequent values of the process variable);

(Eq. 2) $$B_1 = (B_0)(1-F) + (PVL)(F),$$

where PVL is the present value of the process variable, F is an empirically-determined constant or weight factor greater than 0 and less than 1, B_0 is the prior value of the 'alarm base' (from the previous equation), and B_1 is the recalculated value of the 'alarm base'; and

(Eq. 3) $$UAV = B_1 + K,$$

where UAV is the updated value of the alarm limit, and K and B_1 are from equations (1) and (2).

As each successive updated value (UAV) is determined, it is substituted for the last alarm-limit value (CAV) in order to monitor the process variables (see App. 11A).

The updated alarm-limit value is thus defined to be a constant value ("K") greater than the value of

[2] See R. Brown, *Smoothing, Forecasting and Prediction of Discrete Time Series* (1963) (hereafter "Brown"), at 101–104.

the alarm-base B_1 (equation 3).[3] This alarm-base value is in turn calculated according to a smoothing function of the present and previous values of the process variable ("*PVL*") in question. The effect of utilizing this smoothing function can best be illustrated by carrying out a sample calculation, taken from the patent application.

In Example 1 in respondent's specification (App. 10A–12A), the process variable that is being monitored is the temperature of the reactor bed of catalyst, and the alarm-offset constant ("*K*") and alarm-base weighting factor ("*F*") have been set at +9° and 0.6, respectively. At the beginning of the process, the reactor bed temperature is 432°. The first value of B_0 therefore is also 432°, since it is defined as the initial value of the process variable. After the first time interval [4] elapses, the reactor bed temperature has increased to 436°. The first recalculated value of the alarm-base function B_1 is thus the weighted sum of 60 percent of the present temperature and 40 percent of the past temperature (with the 60–40 weighting being determined by the weighting factor *F*). It is calculated (according to Equation 2) as follows:

(Eq. 2) $B_1=(B_0)(1-F)+(PVL)(F)$

(Eq. 4) $B_1=(432)(0.4)+(436)(0.6)$
$=434.4.$

Substituting this value for B_1 in Equation 3 gives the first alarm-limit value *UAV*:

(Eq. 5) $UAV=434.4+9=443.4.$

[3] If *K* is a negative number, the value of *UAV* will be a constant value less than the alarm base function B_1. In other words, when *K* is negative, a lower (rather than an upper) limiting value is calculated.

[4] In respondent's Example 1, measurements and calculations are made every ten minutes (App. 11A).

After ten more minutes have elapsed, the temperature has increased to 440.5. Thus the new B_1 (the recalculated value of the alarm base after the second measurement) is calculated as follows (again, according to Equation 2):

(Eq. 6) $B_1=(434.4)(0.4)+(440.5)(0.6)=438.1,$

and the updated alarm-limit value (again, according to Equation 3) is:

(Eq. 7) $UAV=438.1+9=447.1.$

Thus the new alarm-base value B_1 is a weighted sum of 60 percent of the present temperature and 40 percent of the function of the two previous temperatures that was calculated in Equation 4, above.

At the third time interval, the temperature was measured at 444.5°. Carrying out the algorithm again produces the following result:

(Eq. 8) $B_1=(438.1)(0.4)+(444.5)(0.6)=441.9.$
(Eq. 9) $UAV=441.9+9=450.9.$

At the fourth time interval, the temperature was measured at 448°. The updated values of B_1 and *UAV* are again calculated according to equations 2 and 3, respectively:

(Eq. 10) $B_1=(441.9)(0.4)+(448)(0.6)=445.6.$
(Eq. 11) $UAV=445.6+9=454.6.$

As can be seen by comparing Equations 10, 8, 6, and 4, in each successive calculation of the alarm-base function the most recent measured value of the process variable is the most heavily weighted, while all the previous values of the process variable are "lumped together" in one term, so that each preceding one is

weighted less heavily. If the most recent value of the process variable is designated as PVL_1, and the next most recent value as PVL_2, etc., equation 10 may be rewritten and extrapolated as follows:

(Eq. 12) $B_1=(0.6)(PVL_1)+(0.4)[(0.6)(PVL_2)+(0.4)\{(0.6)(PVL_3)+(0.4)[(PVL_4)(0.6)+\ldots]\}]$

Collecting the terms,

(Eq. 13) $B_1=(0.6)(1)(PVL_1)+(0.6)(0.4)(PVL_2)+(0.6)(0.4^2)(PVL_3)+(0.6)(0.4^3)(PVL_4)+\ldots$

Thus,

(Eq. 14) $B_1=(0.6)(PVL_1)+(0.24)(PVL_2)+(0.096)(PVL_3)+(0.0384)(PVL_4)+\ldots$

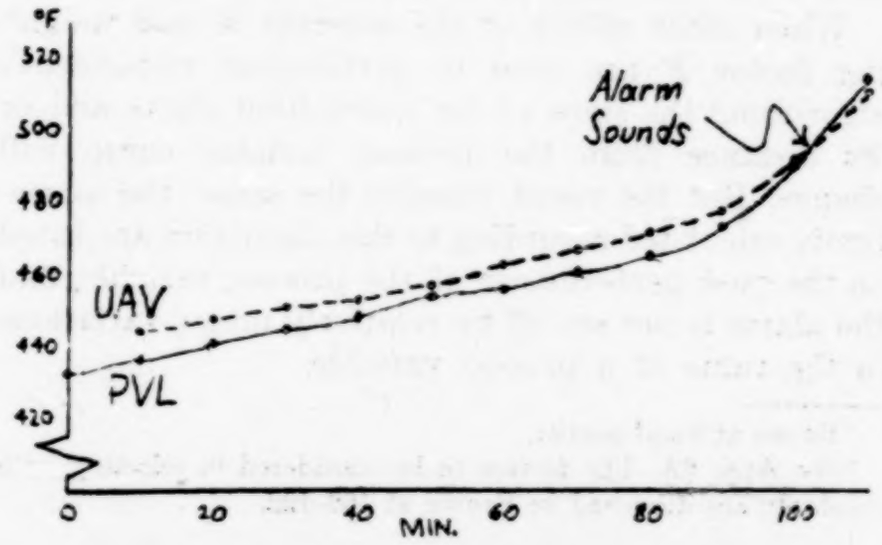
Equations 12–14 show the actual weight that each previous value of the process variable is given in this calculation of the alarm-base. It is readily seen that the more recent values are weighted more heavily than older values, in accordance with a geometric proportion.[5] The final updated alarm value is, of course, simply the sum of a constant number and this alarm-base value.

[5] The alarm-base function may be generalized substantially as follows, an expression in which B_t=the latest (or current) value of the alarm-base function:

(Eq. 15) $$B_t=(F)\sum_{i=0}^{t}(PVL)_{t-i}(1-F)^i$$

See Brown at 101 (deriving a similar expression). Brown explains that such exponential smoothing calculations "produce an average in which past observations are geometrically discounted according to their age" (*id.* at 106).

The values of the reactor bed temperature ("*PVL*") and the corresponding updated alarm-limit values ("*UAV*") for the first twelve temperature measurements in this example are plotted as curves in Figure 4:[6]



It can be seen from Figure 4 that the curve of the alarm limits calculated according to respondent's algorithm reflects the general shape of the curve of the process variable. Only at the point at which the process variable value increases "too suddenly" (between 100 and 110 minutes, from 490° to 515°) does the corresponding alarm-limit value fail to rise fast enough to reflect the temperature curve; it is at this point that the measured temperature exceeds the alarm limit (and, presumably, the alarm is set off). The curve of the constantly recalculated alarm limits is, in effect, a "smoothed-out" version of the curve of the measured temperatures, allowing the temperature to vary as long as it remains less than the alarm limit.

[6] Figure 4 is taken from the chart illustrating Example 1 of respondent's specification (App. 12A).

Such smoothing functions are commonly used in business and manufacturing applications to correct for variation in the predicted performance of the variables that are being observed or controlled, such as speed, temperature, amount of inventory in stock, orbits for satellites, missile positions, rainfall, etc.[7]

When other values of the constant K and weighting factor F are used in performing respondent's algorithm,[8] the slope of the alarm-limit curve and/or its distance from the process variable curve will change. But the result remains the same: the alarm-limits calculated according to this algorithm are based on the past performance of the process variable, and the alarm is not set off by relatively minor variations in the value of a process variable.

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[7] Brown at 9 and *passim*.

[8] See App. 6A. The factors to be considered in selecting such constants are discussed in Brown at 106–122.

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1977.

No. 77-642

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS,

Petitioner,

vs.

DALE R. FLOOK,

Respondent.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

RESPONDENT'S BRIEF.

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RESPONDENT'S BRIEF.

THE CONSTITUTIONAL PROVISIONS, STATUTES AND REGULATIONS INVOLVED.

For the convenience of the Court and Counsel, the relevant constitutional, statutory and regulatory provisions are set forth in full text in the Appendix which appears at the conclusion of this brief.

SUMMARY OF ARGUMENT.

The respondent, Dale R. Flook (hereinafter called "the applicant") applied for a patent on a new method for more reliably monitoring the values of process variables in a catalytic hydrocarbon conversion facility, in order to signal the occurrence of abnormal and perhaps dangerous conditions. The Court below

held that the method claimed was patentable subject matter within the meaning of 35 U. S. C. § 101.

The Acting Commissioner of Patents and Trademarks, Lutrelle F. Parker (hereinafter called "the Commissioner") seeks a reversal, contending that (1) the patent applicant's sole inventive contribution is a mathematical algorithm to be conventionally implemented; (2) the decision of the Court below is inconsistent with well-settled judicial interpretation of the patent statute; and (3) changing the standards of patentability to permit the patenting of computer applications of mathematical algorithms would raise serious problems and impose a substantial additional burden on the Patent Office.

To bypass the "burden" of examining the applicant's invention on its merits, the Commissioner asks the Court to declare the applicant's invention unpatentable solely on the basis of Section 101 of the Patent Act. The Commissioner ignores the fact that Section 101 is only one part of an overall statutory structure. Section 101 enumerates the *categories* of subject matter (*i.e.*, "process, machine, manufacture, or composition of matter, or any new and useful improvement thereof") which may be patented *if* the various tests of novelty set forth in Section 102, *and* the test of non-obviousness set forth in Section 103, are met. The Commissioner, in effect, asks this Court to rewrite Section 101 to include a test of inventiveness which was not intended to be included within the purview of its simple and unambiguous language.

The Commissioner has not inadvertently confused the intended purposes of Sections 101, 102 and 103, but has deliberately relied upon this confusion, and upon a collection of dicta which predates the 1952 Patent Act and which in no sense represents "well-settled judicial interpretation of the patent statute," to avoid the statutory duty which Congress has placed upon his agency.

The statutory scheme for insuring that bad patents don't issue demands that the Patent Office examine inventions to insure

that they meet all the tests of patentability before a patent is granted. As this Court said in *Graham* v. *John Deere Co.*:

> It is the duty of the Commissioner of Patents and of the courts in the administration of the patent system to give effect to the constitutional standard [Art. 1, Sec. 8] by appropriate application, in each case, of the statutory scheme of the Congress.
>
> . . .
>
> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined.
>
> . . .
>
> It must be remembered that the primary responsibility for sifting out unpatentable material lies in the Patent Office.

383 U. S. 1 at 6-18.

The Commissioner would have the applicant's invention here peremptorily declared unpatentable for implied Section 103 reasons, without properly following the examination procedure demanded by Section 103. Applicant is entitled to have his invention tested under the plain language of the statute, rather than under an arbitrary and erroneous misuse of the statute for reasons of administrative convenience.

In the Commissioner's view, applicant's invention should not be patented because it is said to embody a "mathematical principle". Based on an unjustified interpretation of this Court's limited holding in *Gottschalk* v. *Benson*, 409 U. S. 63 (1972), and aided by a confused view of Sections 101, 102 and 103, the Commissioner's flawed logic leads to a misstatement of existing law:

> It is axiomatic that an abstract idea such as a mathematical formula is not itself patentable. Moreover, a process or

> method that incorporates a new abstract principle in a way that is conventional in light of existing technology is not patentable. Instead, to be patentable, embodiments of scientific or mathematical principles must be implemented in an inventive manner.

Brief for the Petitioner, Summary of Argument at 9.

Of course an "abstract idea" is not patentable; it is clearly not a "process, machine, manufacture or composition of matter . . ." as required by Section 101. But to assert, as the Commissioner does, that *Section 101 alone* prohibits a new idea from forming the basis for a patentable invention, *unless "implemented in an inventive manner"*, cannot be supported by the clear and simple language of Section 101. Once a "new idea" is implemented in some form falling within a Section 101 category, then patentability is substantively determined by the conditions of Sections 102 and 103.

The Commissioner proposes instead to re-legislate Section 101 to include a requirement clearly not intended by Congress and in direct conflict with the remainder of the Act. The Commissioner states that:

> To merit monopoly protection, it is not sufficient that a claim embody a concrete, tangible application of a mathematical or scientific principle; it must also extend beyond the routine, conventional, or uninventive applications that follow once the applicant possesses the idea.

Brief for the Petitioner at 19.

The Commissioner's proposed rule is unlikely to find favor with those inventors who necessarily complete their creative thinking before they physically implement their inventions.

ARGUMENT.

I. Applicant's Invention Is Statutory Subject Matter Under Section 101 of the Patent Act.

The issue before this Court is whether or not the subject matter claimed by the patent applicant Flook properly falls within one of the statutory categories of inventions that may be patented, as defined by 35 U. S. C. § 101 (1952). Since the Court should not be asked to establish principles or guidelines in the abstract, it is essential first to define the invention in issue here. Simply stated, it is: "A method for updating the values of alarm limits on process variables involved in a process comprising catalytic chemical conversion of hydrocarbons".[1] The claims presented by the applicant Flook for examination by the Patent Office are all directed to:

> A method for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons . . .[2]

In further defining his invention, the applicant Flook employs mathematical formulas to describe an algorithm[3] which makes up part of the claimed method. As stated by the Court below:

---

1. Application of Dale R. Flook, filed October 29, 1971, App. 3A.

2. The preamble to Claim 1 and to each of dependent Claims 2 to 10. App. 63A.

3. The QUESTION PRESENTED, as stated by the Commissioner, characterizes this case as one in which "the patent applicant's sole inventive contribution is a mathematical algorithm to be conventionally implemented". Yet, the meaning of the uncommon term "algorithm" is nowhere explained. For purposes of clarity, respondent suggests that the following definition is appropriate:

> *Algorithm*, a set of steps designed to achieve a complex mathematical operation, each step carrying the operation forward by one small increment, and perhaps with the built in repetition of a step or set of steps until certain conditions are reached.

The New Encyclopedia Brittanica 239 (1974).

> The issue in this case is whether a claim to a process which *uses* an algorithm to modify a conventional manufacturing system is statutory subject matter . . .

Application of Flook, 559 F. 2d 21, 22 (C. C. P. A. 1977).

The statutory provision to be applied is clear and explicit:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

35 U. S. C. § 101 (1952).

The applicant Flook concedes that he did not invent, and asserts that he does not seek to patent or to otherwise preempt, a "mathematical algorithm" for merely solving a mathematical equation. What the applicant Flook did invent and does seek to patent is a method for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic chemical conversion of hydrocarbons. The subject matter is specific and precise. In describing that subject matter, algebraic symbols and equations have been used as a means of expression and definition. Indeed, such means of definition are both appropriate and customary. The Patent Office's own Rules of Practice expressly so provide.[4] Such mathematical formulas are not, and are not intended by the applicant Flook to be, the expressions of broad, abstract principles. The algebraic symbols used represent precise names given to real and measurable quantities and not mere abstractions.[5] Those quantities govern the specific operation of a particular alarm system as it monitors the performance and safety of a catalytic conversion facility.

4. "The specification, including the claims, may contain chemical and mathematical formulas . . ." 37 C. F. R. § 1.58 (1977).

5. As defined by the claims and the supporting disclosure of the patent application: Bo is the current alarm base; K is a predetermined alarm offset; PVL is the present value of the process variable involved in a process comprising the catalytic conversion of hydrocarbons; B_1 is a new alarm base to be determined; and F is a predetermined number greater than zero and less than 1.0.

The use of mathematical language in the claiming of the invention by the applicant Flook serves to particularly point out and distinctly claim the method disclosed.[6] The claims do not include method language in order to claim indirectly, or in practical effect, mathematics.

II. The Commissioner Seeks to Burden Section 101 with a Requirement for "Invention", Unintended by Congress for That Provision of Title 35, as a Device for Evading the Statutory Duty of Examination for Invention Under the Other Conditions and Requirements of the Patent Law.

The QUESTION PRESENTED here by the Commissioner[7] poses an unfair issue, and seeks to compel its own self-serving answer. Under the guise of the Section 101 definition of *categories* of subject matter which can be patented, the Commissioner has presented an issue of inventiveness on grounds which are wholly outside that statutory provision. The improper characterizations in the QUESTION PRESENTED, such as "sole inventive contribution . . . conventionally implemented",

6. 35 U. S. C. § 112 (1952) provides:

> . . .
>
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention. A claim may be written in independent or dependent form, and if in dependent form, it shall be construed to include all the limitations of the claim incorporated by reference into the dependent claim.
>
> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

7. Whether a method is patentable subject matter under 35 U. S. C. 101 when the patent applicant's sole *inventive* contribution consists of a mathematical algorithm to be *conventionally* implemented, preferably in a *standard* general-purpose digital computer, and applied to control *existing* manufacturing processes.

Brief for the Petitioner at 2. (Emphasis added.)

do not properly arise, either administratively or judicially, under Section 101. The applicant Flook suggests that the QUESTION has been improperly infused by the Commissioner with standards of invention that must be and can only be treated by appropriate patent application examination and rejection, based on supported Patent Office showings of lack of novelty under Section 102 or non-obviousness under Section 103. The Patent Office has improvidently applied an unwarranted and statutorily unauthorized administrative policy[8] in this case, and has rejected the Flook application, not on its inventive merit as measured by Sections 102 and 103, but upon the *ipse dixit* that the claimed method is non-statutory subject matter under Section 101. Yet, the only factual basis for such a rejection is the use by the applicant Flook of mathematical equations in the definition of the method invention claimed.

More precisely, in addition to the "category" test of Section 101, the statutory conditions and requirements for patentability of a new and useful process (or method) included the requirements for novelty and the avoidance of a loss of the right to patent, as specified by Section 102 of Title 35. This record does not establish any rejection, or any basis for rejection, of the patentability of the subject claimed under 35 U. S. C. § 102.

A further condition and requirement of Title 35, and one of special importance in the light of the arguments and contentions now made by the Commissioner, is that of non-obvious subject matter, as required under Section 103. The record in this case

8. Applicant's patent application was filed on October 29, 1971 (App. 3A). Following this Court's November 20, 1972 decision in *Gottschalk* v. *Benson*, 409 U. S. 63, the Patent Office examining corps was instructed to review all pending and allowed applications, including those in which final issue fees had been paid, for possible application of the *Benson* decision and that *"all doubts will be resolved against the applicant"*. "Patent Office States Tentative Policy on Computer Programs", 106 Pat. T.M. Copyright Journal (BNA), December 7, 1972. Thereafter, on September 24, 1973, applicant's claims 1-10, four of which had previously been rejected under Section 112 (a rejection later withdrawn, App. 46A), were rejected for the first time under Section 101 (App. 18A).

provides no basis for the Commissioner's implication that the subject matter as a whole, and as claimed by the applicant Flook, is disqualified from patentability by reason of obviousness. The Patent Office never rejected a single claim as lacking novelty or as being obvious.[9]

The Patent Statute expressly provides for examination[10] as to novelty and non-obvious subject matter. In this case, the Patent Office found applicant's invention to be unpatentable on one ground only:

> Claims 1-10 are rejected under 35 U.S.C. 101 as being drawn to an invention which is not one of the types of inventions set forth in 35 U.S.C. 101 as patentable under the statute.

App. 46A.

9. In any event, since the Board concluded that respondent's claims did not contain patentable subject matter as defined in Section 101, it did not reach the question whether the process was barred from patentability by Section 103. Therefore, the question whether the claim embodied a sufficient advance over the prior art to merit a patent was not before the court below and is not before this Court.
Brief for the Petitioner at 14, n. 11.

The real reason the Board "did not reach" the question of obviousness was that there had *never* been a rejection by the Examiner under either Section 102 or 103 (App. 18A, 26A, 46A, 52A).

10. The Commissioner shall cause an examination to be made of the application and the alleged new invention; and if on such examination it appears that the applicant is entitled to a patent under the law, the Commissioner shall issue a patent therefor.
35 U. S. C. § 131.

> Whenever, on examination, any claim for patent is rejected, or any objection or requirement made, the Commissioner shall notify the applicant thereof, stating the reasons for such rejection, or objection or requirement, together with such information and references as may be useful in judgment of the propriety of continuing the prosecution of his application * * *.
35 U. S. C. § 132 (1952).

See also 35 U. S. C. §§ 6, 8 and 37 C. F. R. § 1.104-1.106 in the Appendix to this Brief.

The fact that the subject matter sought to be patented by the applicant Flook is a new[11] and useful[12] process (or method)[13] is not contested. Such subject matter qualifies for patentability, provided only that it fulfills the other conditions and requirements of Title 35, including particularly novelty and non-obvious subject matter. There has been no rejection of the claims by the Patent Office on the ground of lack of utility or of lack of novelty, or of non-obvious subject matter.[14] The Commissioner inflicts the mischief of confusion in this case by presenting a QUESTION, and by arguing, in terms loaded with language of purported anticipation and obviousness. This imposes a regrettable misconstruction upon a carefully-worded and highly-refined statute, and distorts[15] its otherwise clear meaning.

11. The Examiner evidently concluded that Respondent's mathematical formulae were novel (App. 26A, 48A-49A). We do not contest this conclusion.
Brief for Petitioner at 14, n. 12.

With respect to novelty, the Commissioner has asserted that "It is not disputed that, aside from the novel algorithm for computing updated alarm limits, every aspect of respondent's claimed invention is conventional and well-known in the art." (Brief for Petitioner at 7).

Actually, the applicant never conceded anything with respect to novelty, and never needed to, because there never was a rejection on the basis of a lack of novelty (see note 9, *supra*). All applicant ever conceded was that, *given applicant's teaching*, one of ordinary skill could practice the invention disclosed (*see*, for example, App. 21A-23A).

12. "The Examiner agrees that his invention is a technologically useful invention" App. 47 A.

13. The QUESTION PRESENTED, as stated by the Commissioner, is directed to whether "a method" is patentable subject matter under the conditions set forth. In the Petition for Writ of Certiorari herein, at 13 n. 17, it is acknowledged that within the context of 35 U. S. C. § 101:

> "Respondent's claims fall solely within the last of the four enumerated classes (processes or methods) . . ."

35 U. S. C. § 100 states that "The term 'process' means process, act or *method* . . ."

14. *See* note 9, *supra*.

15. For example, Section 101 makes no mention of a new and useful "advance", as improperly read into it by the Commissioner.

(Footnote continued on next page.)

The Patent Office has, improperly, injected considerations of inventiveness into the Section 101 definition of *categories* of patentable subject matter. The application of Section 101 is not dependent in any way upon non-obviousness. Yet, the Brief for the Petitioner is repetitive throughout with those expressions of language which are only properly applicable to the conditions and requirements of non-obvious subject matter under 35 U. S. C. § 103 (1952).[16]

The legislative history of the 1952 Patent Act, as explained in *Graham* v. *John Deere Co.*, 383 U. S. 1 (1966) makes it clear that Section 101 is not concerned with the presence or absence of "inventiveness". While it is correct to state that the 1952 Patent Act was intended by Congress to be merely a codification of judicial precedent, Congress did so by stating for the first time, in Section 103, a condition which had previously existed only by reason of Court decisions and not by statute.

The original Patent Act of 1790 provided that, "upon the petition of any person or persons . . . [who] . . . had invented

(Footnote continued from preceding page.)
The misstatement that processes under Section 101 are limited to "processes for making or using . . . machines, articles of [*sic*] manufacture, [or] composition of matter" so far departs from the precise language of Section 101 as to demonstrate that such distortion of the clear statutory language by the Commissioner is neither inadvertent nor incidental. Brief for the Petitioner, at 11.

16. The Brief for the Petitioner is improperly burdened with a litany of "invention" terminology inapplicable to and wholly absent from Section 101: "Advance over the prior art" (at 9); "must be implemented in an inventive manner" (at 10); "only the inventive use . . . warrants patent protection" (at 10); "predictable in light of the prior art" (at 13); "a novel and inventive manner" (at 14); "the non-inventive application of a mathematical result" (at 19); "must extend beyond the routine, conventional, or uninventive" (at 21); "new combinations of old elements are patentable only if they are inventive (at 21, n. 20); "inventive contribution" (at 22); "straightforward and conventional implementations" (at 22); and, "non-inventive computer applications" (at 24). Similarly, the inclusion of the Appendix at the conclusion of the Brief for Petitioner is an irregular excursion made entirely outside the record. The purported prior art there gratuitously discussed is uncited in the proceedings of record. The entirety of such inappropriate advocacy zeal may be disregarded by the Court.

or discovered any useful art, manufacture, engine, machine, or device, or any improvement therein not before known or used", a patent could be procured if the examining group found that "the invention or discovery [was] sufficiently useful and important". Patent Act of 1790, § 1, 1 Stat. 110. No standard of patentability beyond the bare requirements of novelty and utility was included in this earliest statutory test. Instead, it was left to the courts to determine and to evolve a judicial standard of "invention" for a patent grant. As stated by this Court in *Graham:*

> Although the Patent Act was amended, revised and codified some fifty times between 1790 and 1950, Congress steered clear of the statutory set of requirements other than the bare novelty and utility tests reformulated in Jefferson's draft of the 1793 Patent Act.

383 U. S. at 10.

Thus, it is seen that Section 101 has its genesis in the original statutory, minimum standard of "bare novelty", and is not concerned with the judicially-developed standard of "invention", now codified in Section 103. The Court made this important distinction clear in *Graham:*

The 1952 Patent Act:

> The act sets out the conditions of patentability in three sections. An analysis of the structure of these three sections indicates that patentability is dependent upon three explicit conditions: novelty and utility as articulated and defined in § 101 and § 102, and non-obviousness, the new statutory formulation as set out in § 103. The first two sections, which trace closely the 1874 codifications, express the "new and useful" tests which have always existed in the statutory scheme and, for our purposes here, need no clarification.

383 U. S. at 12.

It is submitted that the adoption of the views expressed by the Commissioner, that Section 103 considerations of "invention" are also proper considerations under Section 101, would unnecessarily confuse the law, and represent a serious setback in the search for standards which this Court, the lower courts,

and Congress undertook for more than 160 years, and which was finally culminated in the 1952 Patent Act.

It should not be thought that the Commissioner has merely failed to rely on the correct section of the statute through inadvertence or mistake, and that the result he urges could have been obtained by relying instead on Section 103. The result which the Commissioner seems to seek is the avoidance of the patent examination process altogether in mathematically defined inventions, even though, as this Court made clear in *Graham*, "the primary responsibility for sifting out unpatentable material lies in the Patent Office".[17]

III. The Commissioner's Rejection of Applicant's Claims Is Not Supported by This Court's Prior Decision in Gottschalk v. Benson.

The Commissioner, in his effort to avoid examining selected patent applications on their merits, has not only muddled the clear meaning of Section 101, but also here seeks to expand this Court's limited holding in *Gottschalk* v. *Benson,* 409 U. S. 63 (1972) into a proposed rule of court law which would relegislate the Patent Statute to accommodate the administrative needs of the Patent Office. The Commissioner suggests that:

> To merit monopoly protection, it is not sufficient that a claim embody a concrete, tangible application of a mathematical or scientific principle; it must also extend beyond the routine, conventional, or uninventive applications that follow once the applicant possesses the idea.

Brief for the Petitioner at 19.

Such a rule would mean, of course, that any inventor whose mental conception of his invention precedes its "concrete, tangible application" could not obtain a patent.[18] In effect, the Commissioner suggests that an inventor's "ideas" are to be con-

17. 383 U. S. at 18.

18. Congress clearly had no such rule in mind when it enacted 35 U. S. C. § 102(g) (1952):

(Footnote continued on next page.)

sidered as if they were in themselves "prior art", and that after "the applicant possesses the idea", he is then required to do something else "beyond the routine, conventional, or uninventive" in applying his idea. The rule of law proposed would empower the Commissioner to selectively elect the classes of claimed inventions to be examined by the Patent Office, and to peremptorily reject as "non-statutory" those inventions of complexity or subtlety which may fall outside the present system for effective review by the Patent Office. (See Brief for the Petitioner at 24, note 23.)

It is submitted that this Court did not intend to mandate in *Benson* a sweeping rule that one cannot, in practical effect, patent *any* so-called "idea". The misplaced reliance by the Commissioner upon the "nutshell" of a single short sentence of the Opinion in *Benson*, without regard to the reasons following it, is unfair to the Court and to the public. The full context must be considered:

> What we come down to in a nutshell is the following:
>
> It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting BCD numerals to pure binary numerals were patented *in this case*. The mathematical *formula involved here* has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly preempt the mathematical formula and in practical effect would be a patent on the algorithm itself.

409 U. S. at 71 (Emphasis added).

It is appropriate to ask: What was it about the "formula" in *Benson* that persuaded the Court to conclude that it should not

(Footnote continued from preceding page.)

> "In determining priority of invention there shall be considered . . . the respective dates of conception *and* reduction to practice of the invention . . ." (Emphasis added.)

Conception means "the formation in the mind of the inventor of a definite and permanent *idea* of the complete and operative invention as it is to be applied in practice." (Emphasis added.) *Townsend* v. *Smith*, 36 F. 2d 292, 295 (C. C. P. A. 1929).

be the subject of patent protection? It is suggested that the *Benson* Court made clear the principle being applied, when it observed:

> As we stated in Funk Bros. Seed Co. v. Kalo Co., 333 U.S. 127, 130, 68 S.Ct. 440, 441, 92 L.Ed. 588, "He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end." We dealt there with a "product" claim, while the present case deals with a "process" claim. But *we think the same principle applies.*

409 U. S. at 69 (Emphasis added).

An analysis of the facts before the Court in the 1948 *Funk Bros.* case reveals that, had the 1952 Patent Act been applied, the patentee's claim[19] would quite properly have failed, not because he had discovered a "phenomenon of nature" but because he had *claimed an old composition of matter*. The *Funk Bros.* decision, as well as numerous other decisions which have been improperly characterized by the Commissioner,[20] merely hold that one who discovers the scientific explanation of why *pre-existing* compositions, machines and processes behave as they do, cannot claim the *old* subject matter as a *new* invention.[21]

In *Benson*, the applicants' process claims were unpatentable for precisely the same reason. In that case, the patent applicants had claimed a method for converting binary-coded-decimal

19. *Funk Bros. Seed Co.* v. *Kalo Inoculant Co.*, 333 U. S. 127, 128, n. 1 (1948).

20. These decisions include: *Davison Chemical Corp.* v. *Joliet Chemicals*, 179 F. 2d 793 (7th Cir. 1950); *Armour Pharmaceutical Co.* v. *Richardson-Merrell, Inc.*, 396 F.2d 70 (3rd Cir. 1968); *National Lead Co.* v. *Western Lead Products Co.*, 324 F.2d 539 (9th Cir. 1963); and *Templeton Patents, Ltd.* v. *J. R. Simplot Co.*, 336 F.2d 261 (9th Cir., 1964).

21. Similarly, claims drawn to cover an *old* product of a *new* process are unpatentable. *Risdon Iron & Locomotive Works* v. *Medart*, 158 U. S. 68 (1895); *Cochrane* v. *Badische Analin & Soda Fabrik*, 111 U. S. 293 (1884); and *American Wood Paper Co.* v. *Fiber Disintegrating Co.*, 90 U. S. (23 Wall) 566 (1874).

(BCD) numerals into pure binary numerals. The claims set forth an algorithm, that is a "set of steps", for carrying out the conversion. The algorithm, though described in words, could equally well have been expressed as a formula stating the logical relationship between BCD and binary. However, even if newly discovered, that relationship was necessarily old because both numbering systems had concededly long been in use. Thus, a patent covering the "method" would, in practical effect, have covered the *old* relationship between the two *old* numbering systems.[22]

How then does the algorithm (set of steps) used by the applicant Flook differ from the algorithm before the Court in *Benson?* The answer is, in two important ways:

First, the formulas set forth in the claims now before the Court do *not* describe a relationship between pre-existing quantities. Until the applicant's method was first practiced, the quantities employed to monitor the process variable, as those quantities are defined in applicant's claims, had never existed. There is thus no attempt here to preempt, in practical effect or otherwise, the use of an old but previously undiscovered relationship between pre-existing quantities.[23]

---

22. The same thing can be said of other mathematically-expressable relationships which have been cited to the Court as examples of things unpatentable. Einstein's famous $E=MC^2$ described for the first time the relationship between energy and mass. Yet, though newly discovered, the relationship itself was not new. E had always equalled MC^2. There had always been an immense amount of energy locked up in mass. Likewise, Newton's formula $F=MA$ merely described the natural (and old) relationship between pre-existing quantities: force, mass and acceleration. The Pythagorean Theorem $H^2=A^2+B^2$ merely described the relationship between the length of the hypotenuse and the lengths of the other two sides of a right-triangle, a relationship as old as the right-triangle itself.

23. As in *Smith* v. *Snow*, 294 U. S. 1 (1935) and *Waxham* v. *Smith*, 294 U. S. 20 (1935), the applicant Flook has "secured the performance of the function by a means which had never occurred in nature and [has] not been anticipated by the prior art; this is a patentable method or process." 294 U. S. 20, 22.

Second, as the Court below found:

> The present claims do not pre-empt the formula or algorithm contained therein, because solution of the algorithm, per se, would not infringe the claims. Thus, *Benson's* holding does not render the claims before us unpatentable.

Application of Flook, 559 F. 2d 21, 23 (CCPA 1977).

In commenting on the totally preemptive character of the quite different *Benson* claims, this Court observed that:

> Here the "process" claim is so abstract and sweeping as to cover both known and unknown uses of the BCD to pure binary conversion. The end used may (1) vary from the operation of a train to verification of drivers' licenses to researching the law books for precedents and (2) be performed through any existing machinery or future-devised machinery or without any apparatus.

409 U. S. 63, 68.

In this case, the Commissioner has suggested (without any basis in the record) that the formulas used in applicant's claims belong to a class of:

> smoothing functions [which] are commonly used in business and manufacturing applications to correct for variation in the predicted performance of the variables that are being observed or controlled, such as speed, temperature, amount of inventory in stock, orbits for satellites, missile positions, rainfall, etc.[24]

Assuming, for the sake of argument, the correctness of the Commissioner's statement, such prior uses would obviously not be in any way encompassed or preempted by applicant's claims which are directed solely to "a method for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic conversion of hydrocarbons . . . ."[25]

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24. Appendix at 8A, included in the Brief for the Petitioner.

25. *Supra*, note 2.

The invention which applicant has disclosed and claimed is thus fully distinguishable from the subject matter before the *Benson* Court. Applicant in no way seeks to patent or preempt a formula or an algorithm for merely solving an equation, nor does he seek to patent both new and future uses of a formula, nor anything that is in fact *old* though previously undiscovered.

Applicant asks only that his invention be declared to be what the record and the law shows it to be: a new and useful method within the meaning of 35 U. S. C. § 101.

CONCLUSION.

The Commissioner seeks from this Court a judicial license to avoid his duty to examine *any* claimed inventions which may involve, in whole or in part, computer applications of mathematical algorithms, merely because such examination "would impose a substantial additional burden on the Patent Office."[26] The Commissioner's attempt to confuse the clear meaning of Section 101 and to extend this Court's limited holding in *Benson* for that improper purpose should not succeed, and the judgment of the Court below should be affirmed.

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April 6, 1978

26. Brief for the Petitioner at 24, note 23.

APPENDIX.

United States Constitution, Statutes and Regulations.

THE CONSTITUTIONAL PROVISION.

ART. 1, SEC. 8. The Congress shall have power . . . To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

UNITED STATES CODE
TITLE 35—PATENTS

Patent Act of
July 19, 1952, C. 950,
§ 1, 66 Stat. 792.

CHAPTER 1—ESTABLISHMENT, OFFICERS, FUNCTIONS

§ 6. Duties of Commissioner

The Commissioner, under the direction of the Secretary of Commerce, shall superintend or perform all duties required by law respecting the granting and issuing of patents and the registration of trade-marks; and he shall have charge of property belonging to the Patent Office. He may, subject to the approval of the Secretary of Commerce, establish regulations, not inconsistent with law, for the conduct of proceedings in the Patent Office.

§8. Library

The Commissioner shall maintain a library of scientific and other works and periodicals, both foreign and domestic, in the Patent Office to aid the officers in the discharge of their duties.

Chapter 10—Patentability of Inventions

§ 100. Definitions

When used in this title unless the context otherwise indicates—

(a) The term "invention" means invention or discovery.

(b) The term "process" means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.

(c) The terms "United States" and "this country" mean the United States of America, its territories and possessions.

(d) The word "patentee" includes not only the patentee to whom the patent was issued but also the successors in title to the patentee.

§ 101. Inventions patentable

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

§ 102. Conditions for patentability; novelty and loss of right to patent

A person shall be entitled to a patent unless—

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or

(c) he has abandoned the invention, or

(d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application filed more than twelve months before the filing of the application in the United States, or

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or

(f) he did not himself invent the subject matter sought to be patented, or

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other. (Amended July 28, 1972, Public Law 92-358, Sec. 2, 86 Stat. 501.)

§ 103. Conditions for patentability; non-obvious subject matter

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Chapter 11—Application for Patent

§ 112. Specification

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention. A claim may be written in independent or dependent form, and if in dependent form, it shall be construed to include all the limitations of the claim incorporated by reference into the dependent claim.

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof. (Amended July 24, 1965, Public Law 89-83, sec. 9, 79 Stat. 261.)

Chapter 12—Examination of Application

§ 131. Examination of application

The Commissioner shall cause an examination to be made of the application and the alleged new invention; and if on such examination it appears that the applicant is entitled to a patent under the law, the Commissioner shall issue a patent therefor.

§ 132. Notice of rejection; reexamination

Whenever, on examination, any claim for a patent is rejected, or any objection or requirement made, the Commissioner shall notify the applicant thereof, stating the reasons for such rejection, or objection or requirement, together with such information and references as may be useful in judging of the propriety of continuing the prosecution of his application.

CODE OF FEDERAL REGULATIONS

Title 37—Patents, Trademarks, and Copyrights

§ 1.58. Chemical and mathematical formulas and tables.

(a) The specification, including the claims, may contain chemical and mathematical formulas, but shall not contain drawings or flow diagrams. The description portion of the specification may contain tables; claims may contain tables only if necessary to conform to 35 U. S. C. 112.

(b) All tables and chemical and mathematical formulas in the specification, including claims, and amendments thereto, must be on pure white durable paper, the surface of which is calendered and smooth, in order to permit use as camera copy when printing any patent which may issue. A good grade of bond paper is acceptable; watermarks should not be prominent. India ink or its equivalent, or solid black typewriter ribbon must be used to secure perfectly black solid lines.

(c) To facilitate camera copying when printing, the width of formulas and tables as presented should be limited normally to 5 inches (12.7 cm.) so that it may appear as a single column in the printed patent. If it is not possible to limit the width of a formula or table to 5 inches (12.7 cm.), it is permissable to present the formula or table with a maximum width of 10¾ inches (27.3 cm.) and to place it sideways on the sheet, in which case the formula or table will appear printed across both

columns of the page in the printed patent. Typewritten characters used in such formulas and tables must be from a block (nonscript) type font or lettering style having capital letters which are at least 0.085 inch (2.2 mm.) high (elite type). Hand lettering must be neat, clean, and have a minimum character height of 0.085 inch (2.2 mm.). A space at least ¼ inch (6.4 mm.) high should be provided between the formulas and tables and the text. Tables should have the lines and columns of data closely spaced to conserve space, consistent with high degree of legibility.

§ 1.104. Nature of examination; examiner's action.

(a) On taking up an application for examination, the examiner shall make a thorough study thereof and shall make a thorough investigation of the available prior art relating to the subject matter of the invention sought to be patented. The examination shall be complete with respect both to compliance of the application with the statutes and rules and to the patentability of the invention as claimed, as well as with respect to matters of form, unless otherwise indicated.

(b) The applicant will be notified of the examiner's action. The reasons for any adverse action of any objection or requirement will be stated and such information or references will be given as may be useful in aiding the applicant to judge of the propriety of continuing the prosecution of his application.

§ 1.105. Completeness of examiner's action.

The examiner's action will be complete as to all matters, except that in appropriate circumstances, such as misjoinder of invention, fundamental defects in the application, and the like, the action of the examiner may be limited to such matters before further action is made. However, matters of form need not be raised by the examiner until a claim is found allowable.

§ 1.106. Rejection of claims.

(a) If the invention is not considered patentable, or not considered patentable as claimed, the claims, or those considered unpatentable will be rejected.

(b) In rejecting claims for want of novelty or for obviousness, the examiner must cite the best references at his command. When a reference is complex or shows or describes inventions other than that claimed by the applicant, the particular part relied on must be designated as nearly as practicable. The pertinence of each reference, if not apparent, must be clearly explained and each rejected claim specified.

FOR ARGUMENT

Supreme Court, U. S.
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No. 77-642

In the Supreme Court of the United States

OCTOBER TERM, 1977

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS, PETITIONER

v.

DALE R. FLOOK

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

REPLY BRIEF FOR THE PETITIONER

WADE H. MCCREE, JR.,
Solicitor General,
Department of Justice,
Washington, D.C. 20530.

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1. Respondent errs in asserting (Br. 7-13) that our argument confuses the standard of non-obviousness prescribed in 35 U.S.C. 103 and the requirement of statutory subject matter under 35 U.S.C. 101. As respondent recognizes, the patent examiner's sole ground for rejection of the claims at issue was that they did not cover statutory subject matter under 35 U.S.C. 101. We do not contend that respondent's particular algorithm for computing updated alarm-limits is not novel or is obvious within the meaning of 35 U.S.C. 102 or 103. We simply contend that the subject matter he

seeks to patent is unpatentable under 35 U.S.C. 101, because it is not an "invent[ion] or discover[y]" within the meaning of that Section.[1]

The plain language of Section 101 requires that the application of a mathematical algorithm involve invention or discovery for it to be patentable. It states that patents may issue only to one who "*invents* or *discovers* any * * * process, machine, manufacture, or composition of matter" (emphasis supplied). This language dates from the original Patent Act of 1790.[2] In none of the subsequent amendments to the patent statute has Congress altered this basic requirement.

Yet respondent would have the courts ignore this explicit language and adopt a new rule that would allow patents to issue to anyone who "[*applies for a patent on*] any * * * process, machine, manufacture, or composition of matter, * * * subject to the conditions and requirements of this title". Congress could have changed the language of Section 101 to broaden the statutory standards of patentability, but it did not; indeed, respondent agrees (Br. 11) that in the 1952 Patent Act revision, Congress intended to codify the existing judicial precedents regarding the standard of patentability.

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[1]We thus put aside, as unresponsive and immaterial, the contention that the test of inventiveness that we urge fails to consider the obviousness of the claimed subject matter "as a whole." We may assume that this is the test appropriate in determining obviousness under 35 U.S.C. 103. But it is not apposite here, where the question is whether the claimed subject matter constitutes the "invent[ion] or discover[y]" of a process under 35 U.S.C. 101.

[2]1 Stat. 109, Section 1. The exact language is quoted in our opening brief, 11 n. 9.

It is true that, by the addition of Section 103 to the 1952 Act, Congress codified the judge-made requirement of non-obviousness over the prior art—which was *one* aspect of the general pre-1952 standard of "invention" that the case law had developed. But enactment of this section did not affect the long-standing rule, grounded in the Patent Clause of the Constitution and applied in such cases as *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*,[3] that certain classes of subject matter—*e.g.*, scientific principles, phenomena of nature, etc.—are not patentable because they are "the basic tools of scientific and technological work" (*Gottschalk* v. *Benson*, 409 U.S. 63, 67). Indeed, even if a scientific discovery is non-obvious within the meaning of Section 103— like Einstein's theory of relativity—it is not patentable subject matter under Section 101.

In *Gottschalk* v. *Benson*, 409 U.S. 63, this Court reaffirmed the rule of the *Funk* case in a case involving mathematical algorithms, which are the building-blocks of modern computer technology. Benson's claims were rejected under Section 101, not under Section 103; the same analysis requires rejection of Flook's claims for a patent on a mathematical relationship between process-variable values, just as it should apply to all subsequent patent applications claiming unpatentable subject matter.[4]

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[3]333 U.S. 127. This case is discussed extensively in our main brief, pp. 19-20. *Funk* carries forward this rule from a long line of earlier precedents. See, *e.g.*, the cases cited *id.* at 12, n. 10 and accompanying text.

[4]Respondent urges (Br. 15-16) that the claims in *Benson* were unpatentable because they related simply to the pre-existing relationship between two established numbering systems, while his claims are patentable because they do not describe a relationship between pre-existing quantities. But respondent's claims, like Benson's, describe a mathematical formula that has a practical

By denying the instant patent application, the Patent and Trademark Office is carrying out the statutory command that patents be granted only for the "invent[ion] or discover[y]" of patentable subject matter—a command that derives from the constitutional authorization, and its limitation on Congress' power, that patents be granted only to "Inventors" for "Discoveries," and "[t]o promote the Progress of Science and useful Arts" (Article I, Section 8, Clause 8).[5]

2. Respondent further contends (Br. 13-14) that acceptance of petitioner's test for patentable subject matter would preclude the patenting of any invention whose conception preceded its reduction to practice.[6] But again, this argument misconceives the scope of petitioner's

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application. Respondent's formula describes the relationship between the past and present values of a process variable and its predicted future value in a conventional industrial process. That is no less a "pre-existing relationship" than the one involved in *Benson*. Moreover, a holding that Flook's claims are indistinguishable from Benson's would not preclude all possibilities of patenting computer programs. In this case, the patent examiner specifically found that "[t]he only difference between [respondent's] claims and the prior art is in the mathematical formula involved in updating the value of an alarm limit" (App. 26A; see also App. 47A-49A). Flook's claims cover a "method" that consists of a formula for calculating numbers, and it is thus unpatentable under *Benson*, regardless of whether it is embodied in a computer program or accomplished by mental calculation.

[5]See *Graham* v. *John Deere* Co., 383 U.S. 1, 5-6.

[6]This argument is apparently based on the erroneous theory that the application of any idea, once conceived, is necessarily routine and noninventive. See also Brief Amici Curiae for American Patent Law Association and Los Angeles Patent Law Association, pp. 13-17. This theory ignores, for example, the inventiveness of Morse's and Bell's respective forms of apparatus that they devised to carry out their ideas to use laws of nature for a novel and useful purpose. See *Benson, supra*, 409 U.S. at 68-69.

position. A test of inventiveness of implementation is appropriate for claims that are tantamount to claims to mathematical or scientific principles, in light of the policy that patents must not be awarded on claims that preempt basic scientific concepts. *Funk* and *Benson* indicate that this important policy dictates that an "invention" that does no more than apply such a basic principle in a straightforward, conventional manner does not merit a grant of the patent monopoly.[7]

In the present case respondent claims a mathematical formula, the solution of which is conventionally applied to conventional technology. The formula itself is, concededly, unpatentable, but respondent seeks to transform it into a patentable "invention" by the conventional application of its results to monitor existing processes.[8] To require the award of patent monopolies for

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[7]It is argued that *Eibel Process Co.* v. *Minnesota & Ontario Paper Co.*, 261 U.S. 45, is contrary to this principle, and to *Funk*. The patentee in *Eibel* was the first to utilize the force of gravity to speed up the feeding of paper in a paper-making machine. Assuming, *arguendo*, that *Eibel* survived *Funk* and *Benson*, it is inapposite because it did not involve a finding that application of a scientific principle was straightforward or conventional. The Court in fact held that the application was inventive, and not routine at all (*id.* at 55, 60).

[8]Respondent cites no authority, and we know of none, that allows a mathematical formula to be patented simply because its solution may be applied to existing technology. *MacKay Radio & Telegraph Co.* v. *Radio Corp. of America*, 306 U.S. 86, on which amici rely, involved the alleged infringement of one of R.C.A.'s patents for the configuration of radio transmittal antennae. The Court did not decide whether the patent in question was valid, because it found

such claims would create an unwarranted burden for all who use and develop computer software based on mathematical algorithms.

For these reasons, as well as those discussed in our opening brief, the judgment of the Court of Customs and Patent Appeals should be reversed.

Respectfully submitted.

WADE H. MCCREE, JR.
Solicitor General.

APRIL 1978.

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that it was not infringed. On the subject of patentability, the Court stated the rule (quoted in *Benson, supra,* 409 U.S. at 67) that (306 U.S. at 94)—

> a scientific truth, or the mathematical expression of it, is not a patentable invention [though] a novel and useful structure created with the aid of knowledge of scientific truth may be.

It then cast doubt on whether the claimed invention warranted a patent, stating (*ibid.*; emphasis supplied):

> We assume, without deciding the point, that this advance was invention *even though it was achieved by the logical application of a known scientific law* to a familiar type of antenna.

Supreme Court, U. S.
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Petitioner,

v.

DALE R. FLOOK,
Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals

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BRIEF AMICUS CURIAE FOR THE COMPUTER & BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION (CBEMA)

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IN THE

Supreme Court of the United States

OCTOBER TERM 1977

No. 77-642

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS & TRADEMARKS,
Petitioner,

v.

DALE R. FLOOK,
Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals

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BRIEF AMICUS CURIAE FOR THE COMPUTER & BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION (CBEMA)

I

QUESTION PRESENTED

Whether a process is patentable under 35 U.S.C. § 101 where the sole point of novelty in the process is a mathematical algorithm.

II

INTEREST OF THE COMPUTER & BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION

This brief Amicus Curiae is submitted by the Computer & Business Equipment Manufacturers Association (CBEMA) in accordance with Rule 42(2) of this Court. CBEMA has received consent from both parties to file this brief. The letters of consent have been filed with the Clerk of the Court.

CBEMA is the trade association which, along with its predecessor, the Business Equipment Manufacturers Association, has represented the computer and business equipment industry for the past 62 years. The forty companies comprising the current CBEMA membership include the nation's leading manufacturers of computers, business equipment and computer-related products.[1] While product lines of member companies vary widely, the following list is illustrative: electronic computers, computer software including programs, computer input and output devices, computer storage devices, support services, data transmission equipment, optical character readers, addressing machines, accounting machines, bookkeeping machines and office copying machines. CBEMA is also the approved sponsor under the American National Standards Institute for the processing of domestic and international standards relating to information processing, computers and office machines.

The members of CBEMA who manufacture computer products have consistently been forerunners in achieving major developments in both the concept and application of computer programming and data processing, and have contributed greatly to the present significant status and

[1] The Honeywell Corporation, a member of CBEMA, does not join in the filing of and does not support this brief.

role of the computer in modern society. These members maintain and support extensive activities devoted to applied research and systems development in all phases of computer use and data and information processing.

Not only is the subject matter of the present case of vital concern to CBEMA members and non-CBEMA members in the computer and data processing field, it is also of vital concern to users of computer equipment, including the Government and the public generally. Resolution of the issues presented by this case will have a significant influence upon both the immediate and the future planning of CBEMA members with respect to ways and means of protecting the proprietary fruits resulting from computer program research and development. Thus, the outcome of the present case will inevitably affect the future growth and development of the data processing industry in the United States and will have a corresponding or greater impact on the vast segments of our society which use and receive the benefits of technological advances in the industry.

III

SUMMARY OF ARGUMENT

The question presented by this case is whether a process involving a number of steps, all of which are old except for a novel mathematical algorithm, is patentable subject matter under 35 U.S.C. § 101. The Court of Customs and Patent Appeals answered this question in the affirmative, on the grounds that the last step of respondent's claimed process comprises using the solution of his novel mathematical algorithm to control a conventional chemical process. Accordingly, the Court concluded that respondent was not seeking patent protection for the algorithm itself, a result clearly prohibited by this Court's decision in *Gottschalk* v. *Benson*, 409 U.S. 63 (1972).

Since it is a simple matter for any competent patent draftsman to write claims appending post-solution activity to a novel mathematical algorithm, the decision below effectively sanctions the patenting of such algorithms. To countenance this result would be to recognize form over substance and permit the patenting indirectly of that which may not be patented directly.

Respondent's attempt to patent a process in which the sole element of novelty lies in the mathematical formula used therein flies in the face of the long-standing rule that the discoverer of a scientific or mathematical principle has no claim to a monopoly of it. Only a novel and useful application of the principle is patentable subject matter, and one cannot render a non-novel application of such a principle patentable by "borrowing" novelty from the principle. Since respondent's process does not involve a novel application of the principle—or indeed any novelty at all other than the principle itself—his claim must fail.

This is not to say, however, that all process inventions (or, alternatively, apparatus inventions) embodying a novel mathematical algorithm should be unpatentable. Where the claimed invention produces synergism, *i.e.*, where through co-action among the steps of the process, or the elements of an apparatus, the effect of the combination, considered as a whole, is unobvious in view of the individual steps or elements considered separately, the claimed invention should be recognized as being statutory under 35 U.S.C. § 101. Conversely, a combination should not be patentable under 35 U.S.C. § 101 where the sole point of novelty in the combination is a mathematical algorithm and there is no synergism among the elements of the combination. Since there is no synergism in the present case—respondent's process being simply an aggregation of separate steps, each of which produces the same effect as it did in prior art embodiments—the Lower Court's holding should be reversed.

Reversal of the decision below would also obviate the implied holding of the Lower Court that computer programs may be patented—a decision of far-reaching social and economic consequence—which results from the fact that mathematical algorithms, including respondent's algorithm in this case, may readily be programmed. There are a number of policy considerations that militate against the patenting of computer programs. First, the computer and computer programming industries have developed and grown rapidly in an atmosphere of free interchange of computer programs, notwithstanding the absence of patent protection. Second, if patents on computer programs are permitted, users, such as the Government, will be burdened with the difficult, time-consuming and expensive task of determining the existence of potential infringement claims arising out of programs they intend to use. Third, since many countries do not permit the patenting of computer programs, serious international legal and balance of trade problems may result if computer programs become patentable in this country. Reversal of the decision below would not totally preclude protection for computer programs, however, since the new Copyright Act, P.L. 94-553, specifically provides that programs may be copyrighted.

IV

ARGUMENT

A. The Decision Below

Respondent's invention relates to a method for calculating updated "alarm limits" [2] for process variables, such as temperature or pressure, involved in the catalytic conversion of hydrocarbons. The method comprises the steps

[2] An "alarm limit" is the permissible maximum (or minimum) value of a particular process variable. If the value of the process variable goes beyond the alarm limit, corrective action must be taken by the system operator.

of (1) determining the present value of the process variable, (2) updating the alarm limit value by carrying out a mathematical algorithm [3] on the data obtained from the first step,[4] and (3) readjusting the alarm limit to this updated value. In the preferred embodiment of respondent's process a general purpose digital computer is programmed [5] to calculate the updated alarm limit values pursuant to respondent's algorithm.

The record before the Court of Customs and Patent Appeals revealed that the steps in respondent's process are conventional,[6] and that the only novelty therein lies in

[3] An "algorithm" is a step-by-step procedure for accomplishing a desired result or solving a particular problem. *See Gottschalk* v. *Benson*, 409 U.S. 63, 65 (1972).

[4] The mathematical algorithm in the second step, as claimed by respondent, comprises two separate equations—the first for calculating a new "alarm base," *i.e.*, a new base value for the alarm limit, and the second for updating the alarm limit using this new alarm base. The "alarm base," B_1, is determined from the equation: $B_1 = B_0 (1.0 - F) + PVL(F)$, where B_0 is the current alarm base, F is a predetermined number greater than zero and less than 1.0, and PVL is the present value of the process variable. The updated alarm limit value (herein referred to as UAV) is determined from the equation: $UAV = B_1 + K$, where K is a predetermined alarm offset.

[5] A computer program is a set of instructions to a computer as to how it should manipulate data. The computer program may direct something as simple as adding two plus two, or as complex as determining the proper course for a manned flight to the moon. In solving such problems, the computer can only function in accordance with the algorithm used by the programmer for solving the problem. Given a particular algorithm, the programmer takes the limited number of fixed operations which a computer is capable of carrying out and arranges these operations in a sequence so that the desired algorithm is implemented. Once the algorithm has been established, any programmer can program a general purpose computer to perform the steps of the algorithm. See discussion of the basic elements of computer programming in "The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs," 84 Harv. L. Rev. 281, 340-51 (1970).

[6] Record on Appeal to the Court of Customs and Patent Appeals (hereinafter "R"), at 28, 38.

the mathematical algorithm employed in the second step. Thus, in previous control systems, the alarm limits were adjusted manually based upon the present values of the process variables (R 28, 38), or were automatically adjusted after computing updated alarm limit values (R 14, 64). As admitted by respondent, programming of his mathematical algorithm is "well within the ordinary skill of the art" (R 60-61), and the Patent Examiner found "no unexpected results" from automating respondent's process. (R 70).

The Board of Appeals of the Patent and Trademark Office ruled that since respondent's only contribution was "the formulas or algorithm claimed" (R 77) his claims were unpatentable under this Court's decision in *Gottschalk* v. *Benson*, 409 U.S. 63 (1972). The Court of Customs and Patent Appeals reversed, however, holding that respondent had claimed a patentable process under 35 U.S.C. § 101.

B. Respondent's Claimed Process Is Not Patentable Under 35 U.S.C. § 101.

1. *The Decision Below Conflicts with this Court's Holding in* Gottschalk v. Benson.

In *Gottschalk* v. *Benson*, this Court held that a mathematical algorithm for converting binary-coded-decimal numerals into binary numerals, which had been embodied in a computer program, was not a patentable process within the meaning of 35 U.S.C. § 100(b).[7] In reaching this holding the Court looked beyond the form of the claimed invention to its substance—a mathematical algorithm having "no substantial practical application except in connection with a digital computer"—and concluded

[7] 35 U.S.C. § 100(b) provides: "The term 'process' means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter or material."

that the "practical effect" of affirming the Court of Customs and Patent Appeals would be to grant a patent "on the algorithm itself." 409 U.S. at 71-72.

In its decision below, the Court of Customs and Patent Appeals held respondent's process patentable under 35 U.S.C. § 101,[8] based solely on the fact that respondent's claims recite a step subsequent to performance of the mathematical algorithm, namely, adjusting the chemical control system's existing alarm limit to an updated alarm limit calculated by the mathematical algorithm. Based on this post-solution activity the Lower Court reasoned that respondent's claims "do not preempt the formula or algorithm contained therein, because solution of the algorithm, per se, would not infringe the claims." *In re Flook*, 559 F.2d 21 (C.C.P.A. 1977) at 23.

By this decision the Lower Court has permitted the *form* of respondent's claims to triumph over the *substance* of respondent's discovery—a mathematical algorithm—and in the process contravened this Court's explicit holding in *Gottschalk* v. *Benson*. It has taken the untenable position that a process, whose only novelty lies in a mathematical algorithm, is patentable under 35 U.S.C. § 101 if the applicant merely claims that the results of the algorithm subsequently are *used* in conjunction with a physical process.[9]

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[8] 35 U.S.C. § 101 provides: "Whoever invents or discovers any new and useful process, machine, manufacturer or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title."

[9] The fact that all of the steps in respondent's invention are old, with the exception of his novel mathematical algorithm, is vividly demonstrated by recasting Claim 1 (the only independent claim) in so-called "Jepson" form, which is the form preferred by the Patent Office for claiming inventions that are improvements upon known structures or methods:

> 1. In a method for updating the value of at least one alarm limit on at least one process variable involved in the catalytic chemical conversion of hydrocarbons, said method comprising the old steps of (1) determining the present value of said process variable, (2) updating the alarm limit value, and (3) adjusting said alarm limit to said updated alarm limit value; the improvement comprising performing step (2) by solving the following equations:
>
> (a) $B_1 = B_0 (1.0 - F) - PVL(F)$
>
> (b) $UAV = B_1 + K$
>
> where B_0 is the current alarm base, B_1 is the new alarm base, F is a predetermined number greater than zero and less than 1.0, PVL is said present value of said process variable, K is a predetermined alarm offset, and UAV is said updated alarm limit value.

See Ex parte Jepson, 1917 Dec. Com. Pat. 62; Rule 75(e), Rules of Practice in Patent Cases, 36 F.R. 12,689 (Sept. 1, 1971); 5 *Deller's Walker on Patents* § 445, p. 205 (2d ed. 1972).

If the Lower Court's rationale is followed, patents can be obtained on *any* mathematical algorithm simply by appending to the claim any conventional use to which solution of the algorithm could be applied. For example, according to the Lower Court's holding Albert Einstein could have obtained a patent on his equation $E = Mc^2$, which demonstrates the fundamental relationship between energy and matter, simply by claiming its use in connection with the generation of electricity in a nuclear power plant, even though all elements in the claimed invention were old except for this equation. Or, Sir Isaac Newton could have claimed the formula $F = ma$, which expresses the force created by an accelerating body, merely by appending to his claim its use in the operation of an automobile, forging machine, or any other well-known mechanical device employing this elementary principle. Any competent patent draftsman can write claims applying the solution of an algorithm to well-known processes within the technological arts. This Court should not permit its holding in *Benson* to be circumvented by routine claim drafting techniques which hide the true nature of the claimed invention and permit the patenting indirectly of subject matter which may not be patented directly.

The Lower Court's acceptance of form over substance is further illustrated by comparison of the decision below with its earlier decision *In re Christensen*, 478 F.2d 1392 (C.C.P.A. 1973). There, the applicant sought to patent a method of determining the porosity of subsurface formations by first performing a number of well-known mechanical and measuring steps, which yielded the values of various physical parameters, followed by computing the porosity according to applicant's novel mathematical algorithm applied to these parameter values. Since all of the steps, with the exception of the mathematical algorithm, were shown by the prior art, the "narrow" question considered by the Lower Court was whether "a method claim in which the point of novelty is a mathematical equation to be solved as the final step of the method, [is] a statutory method." 478 F.2d at 1394. The Lower Court answered this question in the negative, based upon the following rationale:

> Given that the method of solving a mathematical equation may not be the subject of patent protection, it follows that the addition of the old and necessary antecedent steps of establishing values for the variables in the equation cannot convert the unpatentable method to patentable subject matter. *Id.*

In the present case, however, the Lower Court distinguished *Christensen* on the grounds that respondent's claims included "recitation of post-solution activity, a step in which the solution [of the algorithm] is applied to a control system," notwithstanding the fact that this post-solution step was conventional. 559 F.2d at 23. Thus, according to the Lower Court the only distinction between patentable and non-patentable processes, where the sole point of novelty lies in a mathematical algorithm, is that claims to the former recite post-solution activity while

claims to the latter do not.[10] Since claiming such activity is merely a matter of form, well within the skill of competent patent draftsmen, the Lower Court effectively sanctions the patenting of *any* algorithm.

2. *The Decision Below Is Contrary to the Long-Standing Rule That Ideas and Principles Are Unpatentable and That Only New and Useful Applications of Them May Be Patented.*

Respondent seeks a patent for a process in which the sole point of novelty is a mathematical algorithm, subject matter which even respondent concedes is unpatentable by itself. The law could not be more clearly opposed to this attempt.

The relevant provision in the Constitution governing the granting of patents is contained in Article I, Section 8, Clause 8, which provides:

> The Congress shall have Power . . . to promote the Progress of . . . useful Arts, by securing for limited Times to . . . Inventors the exclusive Right to their . . . Discoveries.

The focus of the patent clause (and the statutes implementing that clause) is on "progress" and Congress is granted only a "qualified authority . . . limited to the promotion of advances in the 'useful arts'." *Graham* v. *John Deere Co.*, 383 U.S. 1, 5 (1966). Consistent with this goal of scientific advancement, this Court has held unpatentable ideas, principles, phenomena of nature, mental processes and other abstract intellectual concepts. This classic wisdom was recently reiterated by the Court in *Gottschalk* v. *Benson*:

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[10] *Compare, In re Chatfield*, 545 F.2d 152 (C.C.P.A. 1976), *cert. denied*, 46 U.S.L.W. 3219 (U.S. Oct. 4, 1977); *In re Deutsch*, 553 F.2d 689 (C.C.P.A. 1977), with *In re Waldbaum*, 559 F.2d 611 (C.C.P.A. 1977); *In re Richman*, 563 F.2d 1026 (C.C.P.A. 1977); *In re de Castelet*, 562 F.2d 1236 (C.C.P.A. 1977).

> "An idea of itself is not patentable." *Rubber-Tip Pencil Co.* v. *Howard*, 20 Wall. 498, 507. "A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right." *LeRoy* v. *Tatham*, 14 How. 156, 175. Phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work.

409 U.S. at 67. *See also Burr* v. *Duryee*, 68 U.S. 531, 570 (1864); *Fuller* v. *Yentzer*, 94 U.S. 288, 289 (1877); *Tilghman* v. *Proctor*, 102 U.S. 707, 724-26 (1880).

From this longstanding rule derives the equally venerable corollary that only a new and useful application of a principle is patentable. "While a scientific truth, or the mathematical expression of it, is not a patentable invention, a *novel and useful* structure created with the aid of knowledge and scientific truth may be." *Mackay Co.* v. *Radio Corp.*, 306 U.S. 86, 94 (1939) (emphasis added).[11]

The requirement that application of a scientific or mathematical discovery be new and useful received its most extensive treatment in *Funk Brothers Seed Co.* v. *Kalo*

[11] The purpose of the novelty requirement is clear. As the Court observed in *Graham*, "The patent monopoly was not designed to secure to the inventor his natural right in his discoveries. Rather, it was a reward, an inducement, to bring forth new knowledge. The grant of an exclusive right to an invention was the creation of society—at odds with the inherent free nature of disclosed ideas—and was not to be freely given. Only inventions and discoveries which furthered human knowledge, and were *new and useful*, justified the special inducement of a limited private monopoly." (383 U.S. at 9; emphasis added.) "Innovation, advancement, and things which add to the sum of useful knowledge are inherent requisites in a patent system which by constitutional command must 'promote the Progress of . . . useful Arts.'" 383 U.S. at 6. *See also Precision Instrument Mfg. Co.* v. *Automotive Maintenance Mach. Co.*, 324 U.S. 806, 816 (1945).

Inoculant Co., 333 U.S. 127 (1948), in which the Court started with the premise that "[h]e who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes. If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end." 333 U.S. at 130. The Court then made clear that invention could not be "borrowed" from the principle or idea itself.

In *Funk*, the patent holder had used known techniques to experiment with various strains of bacteria that were used in connection with fertilizing crops. He discovered that several strains of these bacteria might be found compatible and therefore could be used together. This would eliminate the need for several independent applications to crops of individual strains of the bacteria. The patent holder's experimentation was successful, and he was able to package combinations of these bacteria. It was conceded that the product was new, useful, and more efficient than its predecessors. Nevertheless, the Court held that his discovery was the principle of nature that certain strains of these bacteria were compatible. The method of packaging the bacteria was a simple step once it was known that certain strains were indeed compatible:

> [O]nce nature's secret of the noninhibiting quality of certain strains of the species of Rhizobiu was discovered, the state of the art made the production of a mixed inoculant a simple step. Even though it may have been the product of skill, it certainly was not the product of invention. *There is no way in which we could call it such unless we borrowed invention from the discovery of the natural principle itself.* That is to say, there is no invention here unless the discovery that certain strains of the several species of these bacteria are non-inhibiting and may thus be safely mixed is invention. But we cannot so hold without allowing a patent to issue on

> one of the ancient secrets of nature now disclosed. All that remains, therefore, are advantages of the mixed inoculants themselves. They are not enough. (333 U.S. at 132; emphasis added.)

See also Armour Pharmaceutical Co. v. *Richardson-Merrell, Inc.*, 396 F.2d 70 (3d Cir. 1968); *National Lead Co.* v. *Western Lead Products Co.*, 324 F.2d 539 (9th Cir. 1963); *Davison Chemical Corp.* v. *Joliet Chemicals, Inc.*, 179 F.2d 973 (7th Cir.), *cert. denied*, 340 U.S. 816 (1950).

The *Funk* principle was most recently reaffirmed in *Benson*. Moreover, the *Benson* court explicitly held that the rule was not limited to "product" claims but applied as well to "process" claims such as that at issue herein. 409 U.S. at 67-68. The *Funk* principle therefore mandates reversal in the present case, inasmuch as the only novel subject matter in respondent's process is the mathematical formula.

Respondent discovered a mathematical relationship between certain process variables in the catalytic conversion of hydrocarbons and certain alarm limits as these vary during the conversion process. Since the formula is concededly unpatentable, he seeks only to patent its application. However, the application is clearly not new, and he makes no claim to the contrary. Not only is the use of alarm limits in the process of catalytic conversion of hydrocarbons well established, but the practice of dynamically updating them as the conversion progresses is also standard procedure. (R 7-9.) Nor has respondent devised any new equipment to carry out the application. (R 14, 32-35, 44-49.) Once the mathematical relationship was discovered, the application—be it manual or automatic updating of the limits—was, like the packaging in *Funk*, an obvious and simple step. And, as in *Funk*, there is no way to call this step the product of invention unless we do the impermissible—borrow patentable in-

vention from the discovery of the mathematical formula itself.

3. *There Is No Synergism Resulting from Use of Respondent's Novel Algorithm in a Conventional Process.*

CBEMA does not contend in this case, nor do this Court's prior decisions require, that every process comprising conventional steps and including a novel algorithm is unpatentable. This Court, as well as many lower federal courts, have held that a combination of old elements may be patented only if there is synergism, *i.e.*, the individual steps in the process must co-act in an unobvious way, such that the effect created by the combination, considered as a whole, is unobvious in view of the individual steps considered separately.[12]

While the synergism concept, as such, has been applied in the past only to cases drawing into question obviousness under 35 U.S.C. § 103,[13] there is no logical reason

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[12] *See, e.g., Sakraida* v. *Ag Pro, Inc.*, 425 U.S. 273 (1976); *Anderson's Black Rock, Inc.* v. *Pavement Salvage Co.*, 396 U.S. 57 (1969); *Digitronics Corp.* v. *New York Racing Ass'n, Inc.*, 553 F.2d 704, 747 (2d Cir. 1977); *Parker* v. *Motorola, Inc.*, 524 F.2d 518, 531-532 (5th Cir. 1975), *cert. denied*, 425 U.S. 975 (1976); *Ingersoll-Rand Co.* v. *Brunner & Lay, Inc.*, 474 F.2d 491, 496 (5th Cir.), *cert. denied*, 414 U.S. 865 (1973); *Koppers Co.* v. *S&S Corrugated Paper Machinery* Co., 517 F.2d 1182, 1188 (2d Cir. 1975); *Phillips Industries, Inc.* v. *State Stove & Mfg. Co.*, 522 F.2d 1137, 1141 (6th Cir. 1975); *International Telephone & Telegraph Corp.* v. *Raychem Corp.*, 538 F.2d 453, 457 (1st Cir.), *cert. denied*, 429 U.S. 886 (1976); *Republic Industries, Inc.* v. *Schlage Lock Co.*, 433 F.Supp. 666 (S.D. Ill. 1977).

[13] 35 U.S.C. § 103 provides:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

why it should not also be used in determining the status under 35 U.S.C. § 101 of a process in which the only novel step is a mathematical algorithm. Thus, where every step in the process is old, with the exception of a novel algorithm, patentability of the combination should turn on whether the interaction among the old elements and the new algorithm produces a synergistic effect.

This approach would preclude obtaining patents by facile claim drafting techniques—the evil inherent in the Lower Court's decision—since mere recitation of post-solution steps would not form the basis for patentability. Instead, the claimed combination would be patentable only if there were synergism resulting from use of the new algorithm with the old steps.

In the present case, it is clear that respondent's invention fails to produce any synergistic effect. The old steps in the "exhausted" combination [14] of determining the present value of a process variable (which precedes performance of the algorithm) and readjusting the alarm limit (which follows performance of the algorithm) are unaffected by respondent's novel algorithm. These steps are performed the same way and produce the same results as they did in the prior art; respondent's algorithm has merely replaced the prior art method of generating updated alarm limit values with a method that can be implemented by a computer conventionally programmed in accordance with the steps of the algorithm. Under the foregoing principle, his claimed process clearly is non-statutory, whether the alarm limit values are adjusted manually or automatically.[15]

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[14] *See Digitronics Corp.* v. *New York Racing Ass'n, Inc.*, 187 U.S.P.Q. 602, 631 (E.D.N.Y. 1975), *aff'd*, 553 F.2d 740 (2d Cir. 1977).

[15] R 77.

C. Policy Considerations Against the Availability of Patents for Algorithms and Computer Programs.

While the decision below nominally deals only with the patentability of mathematical algorithms used in conjunction with technological processes, its practical implications are substantially more far-reaching. As explained by respondent in his patent application, the preferred implementation of his algorithm is by computer, *i.e.*. respondent's algorithm is to be programmed on a digital computer, which calculates the updated alarm limits. Since any algorithm can be claimed in the form sanctioned by the Lower Court and since computer programs routinely can be derived from mathematical algorithms (and vice versa), the decision below effectively permits patenting of computer programs. It is this ultimate issue, left unanswered in *Gottschalk* v. *Benson*, that also deserves careful consideration by this Court and to which the remainder of this brief is addressed.

1. *The Computer Industry Has Developed in an Atmosphere of Free Interchange of Computer Programs.*

In three decades the computer industry has become a major and substantial factor in our economy and now impacts virtually all segments of society. When computers were first used commercially less than thirty years ago, a number of respected businessmen, scientists and public officials believed that the ultimate need for such highly sophisticated devices would be limited to a few dozen systems. In fact, the uses and applications of computers have increased beyond the most extravagant earlier projections, and by 1977, over 500,000 computer systems made by American-based companies were reported to be in use, with a cumulative value of $85.7 billion.[16] This

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[16] EDP Industry Report, April 22, 1977, at 4. These figures are for worldwide use of computers made by American companies. In

rapid growth will continue over the next few years, and it has been estimated reliably that by 1981 there will be over 1,100,000 American-made computer systems in use, with a value in excess of $138 billion.[17]

In the so-called programming and software side of the industry, computer users are already spending as much on software as they are on computer hardware, and the software field has itself become a multi-billion dollar sub-industry.[18] Thus, it has been estimated reliably that the gross revenues of United States computer firms from the sale of software throughout the world was $790 million in 1971, $1.6 billion in 1976, and, by 1981, will be $5.6 billion.[19]

The tremendous growth of the computer software industry and the vast number of breakthroughs in the field of programming, which have occurred in the last three decades, have by and large taken place in a legal framework conducive to the free interchange of ideas and information among computer users. Industry experience shows

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the United States alone, the cumulative value of computer systems in use in 1976 is estimated at $43.1 billion and by 1980 this figure is projected at $70.7 billion.

[17] *Id.*

[18] To select an arbitrary point in time to illustrate the growth factor, in 1957 the Association for Computing Machinery had approximately 3,000 members, which represented the vast majority of the working computer programmers in the United States. Some 17 years later, in 1974, it was estimated that there were 195,000 employed programmers and, by 1985, it has been estimated that there will be 290,000 working programmers. *See* "Information Processing In the United States: A Quantitative Summary" (American Federation of Information Societies, Inc., 1977); U.S. Gov. Occupational Outlook Handbook, 1976-77 edition; "Occupational Projections & Training Data," Bulletin 2020 (U.S. Dept. of Labor, Bureau of Labor Statistics 1978).

[19] "Information Processing In the United States: A Quantitative Summary" (American Federation of Information Processing Societies, Inc., 1977), at 11.

that new algorithms and programming procedures, as well as specific programs, have been widely disseminated and generally exchanged. This atmosphere of intellectual freedom has contributed significantly to the enormous strides made in the use of computers.

Wide dissemination of computer programs has benefited the users of computers and the public at large. For years professional journals have published algorithms and pertinent discoveries in mathematics in order to encourage overall advancement of the "state of the art" of programming. At various seminars and symposia on computer programming, open, frank and public discussions have been held concerning newly formulated algorithms or refinements of existing algorithms, and the participants have sought to build upon and improve the overall level of knowledge in the programming field. However, if patent protection for algorithms and their associated computer programs is permitted merely by the semantic innovations allowed by the Lower Court in this case, more restrictive and inhibiting information handling practices will be inevitable. In fact, certain professional journals have already taken the position that they will no longer publish allegedly novel algorithms if the person who develops them claims patent protection.[20]

Another significant consideration is that the programming industry is quite different from other industries in which patent laws have wide application. One of its unique characteristics is that almost all of the end users of programs are also creators and duplicators of pro-

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[20] The Association of Computer Machinery ("ACM") has taken this position with respect to its monthly publication known as the *Communications of the ACM*. The membership of this association includes many professional computer programmers who rely upon and look to such professional journals for maintaining and improving their general knowledge concerning developments in the programming field.

grams.[21] Although there are thousands of computer systems in this country, these systems service millions of users. Many of these user organizations have large staffs of programmers who spend full time preparing new algorithms or sets of instructions for programs, and these same users characteristically spend more for computer programming services than they pay for use of the computer.

In permitting the originator of an algorithm to obtain patent protection simply by claiming post-solution activity, the Lower Court has imposed substantial practical impediments upon all users of computers. Users will be forced to assume a major responsibility for determining potential infringement claims arising out of computer programs they intend to use. They will be burdened with the need to spend substantial time and money in right-to-use searches each time a different algorithm is to be programmed on an existing computer. Some may even employ secret methods of handling computer programming information in order to prevent others from ascertaining that they may have infringed an existing patent. Adversely held patents based upon computer programs will be a constant threat to the unrestricted use of computers.

A patent may be infringed without knowledge of the patent or intent to infringe. If computer programs were patentable by means of the claiming techniques sanctioned by the court below, each user of a computer would proceed at his peril in employing the computer for his particular application. He would never know whether the algorithms in his program were specifically covered by an existing patent or were the equivalent of a claim in a patented program. Such users could be confronted with the real possibility that use of a particular algorithm

[21] It is the user of a computer who often devises the applications programs, *i.e.*, the programs which adapt the computer and a general systems program to his specific uses.

would involve them in infringement litigation unless they were to pay royalties claimed by holders of patents covering allegedly comparable programs.

It is not a practical answer to say that each user could make a search to determine whether his proposed program infringed an existing patent. There is not now—and there does not appear to be in the future—any feasible way in which such searches could be made.[22] Nor can the burden be assumed by or shifted to, suppliers of computers who do not have responsibility for, or often even knowledge of, the precise programs employed by users of their computers.[23]

2. *Programmed General Purpose Computers Are Important To All Phases of Human Endeavor.*

Increased computer utilization stimulated, in part, by the free and open exchange of computer programs, has contributed to a substantial upgrading of the quality of life for every American. The computer has become the

[22] *See* "To Promote the Progress of . . . Useful Arts In An Age of Exploding Technology," *Report of the President's* Commission on the Patent System (Govt. Printing Off. 1966) at 13, which states:

> The Patent Office now cannot examine applications for programs because of the lack of a classification technique and the requisite search files. Even if these were available, reliable searches would not be feasible or economic because of the tremendous volume of prior art being generated. Without this search, the patenting of programs would be tantamount to mere registration and the presumption of validity would be all but nonexistent.

[23] This Court was confronted with an analogous problem in connection with copyright infringement. In *Twentieth Century Music Corp.* v. *Aiken*, 422 U.S. 151 (1975) the Court held that copyright laws did not prevent the proprietor of a restaurant from freely playing his radio for the enjoyment of patrons. In reaching this conclusion the Court observed that "a person in Aiken's position would have no sure way of protecting himself from liability for copyright infringement except by keeping his radio set turned off." 422 U.S. at 162.

"engine" which assists in running our society [24] and in the future will assist man in numerous areas totally unrelated to the usual applications of today's computers.[25] These applications and computer uses should not be clouded by problems resulting from unwitting infringement by computer users.

Some typical examples of computer uses and applications which have occurred and can occur in the next few years include the following:

Health Care

Computers are monitoring instruments and sensors in intensive care units and give an instantaneous current report of the conditions of each patient in a hospital. Computers also record and analyze laboratory tests and maintain accurate medical records on all patients. They are serving communication and information links among various hospitals and individual doctors' offices and clinics, and are beginning to provide current information on many developments in the medical field. Computers are presently being utilized in assisting medical research in searching for cancer cures.[26]

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[24] Binger, The Computer: Engine of the Eighties, Advanced Management Journal (January 1967).

[25] Among the many articles discussing the revolutionary impact computers will have on our society are the following: F. G. Withington, "Beyond 1984: A Technology Forecast," Datamation, Vol. 21, No. 1 (Jan. 1975); Bjerrum, "Forecast of Computer Development and Applications 1968-2000," Futures (June 1969); Martino, "What Computers May Do Tomorrow," The Futurist (October 1969); Hammer, "Electronic Systems of Today and Tomorrow," Paper for State Department Seminar (June 1969); "What Comes Next in the Computer Age," U.S. News & World Report (June 1967); Diebold, "The New World Coming", Saturday Review (July 23, 1966); Ware "Future Computer Technology and its Impact," The Rand Corporation (March 1966).

[26] McCarn and Moriarty, "Computers in Medicine", Hospitals J.A.H.A. January 1, 1971: "The Computer In Medicine," Am.News, (March 2, 1970); "Computers in Medicine," Datamation (May 1969).

Education

Computer-aided training and instrument techniques have moved from research to implementation making high quality education available to more children on an equal basis. Computers will be heavily responsible for enabling everyone regardless of economic status, to have the advantages of higher learning. In addition, computers are being used increasingly in the world's great research libraries to cope with the exploding growth of recorded knowledge.[27]

Science and Engineering

Computers will continue to contribute to further advances in science and engineering. They have already made possible this country's exploration of other planets and the Apollo Program to put a man on the moon. Scientists perform complex mathematical computations with computers and through them, have available large libraries of data for rigorous analysis. Further, utilization of computers will make possible a pushback in the frontiers of mathematics, chemistry, physics and engineering to an extent difficult to comprehend by present standards. Just one example is the search for new energy sources, which will be aided greatly by computers.

Government

Computers present unique opportunities for Government to be more effective and helpful to the average citizen. With the aid of computer programming techniques, a given problem such as pollution control or urban planning, can be simulated in terms of a mathematical model. This model can then be entered into the computer and the

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[27] *See* Computers in Higher Education, Report of the President's Science Advisory Committee, February 1967; Hansen "Computers in Education," The Clearing House (December 1970), Vol. 45, No. 4, p. 195.

data manipulated to simulate actual results from the application of a proposed solution.

Legal

There are also tremendous potentials for computers to assist in relieving the nation's crowded court dockets, to collect and analyze legal documents and precedents, and to achieve better overall administration of the rapidly increasing workload of the police and law enforcement agencies. Computers are being used increasingly by judges and lawyers to assist in legal research, thereby freeing additional time for analysis. Computers also furnish invaluable assistance in collecting, summarizing and cataloging much of the factual data involved in complex litigation and other areas of the law.

Individual

It is reasonable to expect that computers will continue to present unique opportunities for the average individual in his everyday activities. In the home, computers will assist in performing such functions as food procurement, climate and lighting control as well as other home management functions. Also, computers will make it possible for individuals to obtain information needed on many subjects through point-to-point communication with a central computer or small individually-owned computers. Inexpensive electronic hand-held calculators, some of which are programmable, are already in widespread use. In a few years, computer terminals or communication devices will be just as common in homes as telephones or television sets.

3. *Because Many Countries Do Not Grant Patents on Computer Programs There May be an Adverse Financial Impact Upon the United States Unless the Lower Court's Decision is Reversed.*

At present, many countries in Western Europe prohibit the granting of patents on computer programs. Thus, France enacted a statute which specifically prohibits patent protection for computer programs.[28] Similarly, the new British Patents Act, effective June 1, 1978, specifically excludes computer programs from patent protection, and the new European Patent Convention, which also becomes effective June 1, 1978, specifically excludes patent protection for discoveries, scientific theories and mathematical methods, schemes of rules and computer programs.[29]

Since several countries in Western Europe have decided not to extend patent protection to computer software, a serious international legal and balance of trade problem can result if the Lower Court's decision in this case is affirmed. In such case, someone in a foreign country could easily use or copy a program on which a patent has been issued in this country and have total immunity from any infringement claims under our law. Because of the availability of instantaneous communication between Western Europe and the United States, it would then be possible to use the patented program in Europe and communicate the result directly to a computer located in the United States. Under such circumstances, the domestic patent would be rendered virtually ineffective, and the chief result would be a negative impact on our domestic

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[28] Article 7 of the French Patent Law of January 2, 1968. An English translation appears in Industrial Property 67-75 (BIRPI, Geneva, Switz., March 1968).

[29] Present EPC member countries are Belgium, France, Luxembourg, Netherlands, West Germany, Britain and Switzerland. Signatures expected early this year are Denmark, Italy, Sweden, Austria and Eri[illegible].

economy. Among other things, such results would constitute an unfortunate and avoidable violation of United States employment and trade policy.

D. Computer Programs May Be Copyrighted Under the New Copyright Act.

This Court in *Gottschalk* v. *Benson* observed that if proprietary protection under federal statute is considered necessary for computer programs, it should be accomplished through legislation and not through a distortion of the patent laws.[30]

In this connection the copyrighting of computer programs has become established as an acceptable form of protection. In 1964, the Copyright Office determined that computer programs can be registered under the copyright laws if certain requirements are met.[31] Since that announcement, over 1300 such programs have been registered with the Copyright Office.[32]

Copyright protection for computer programs is now explicitly provided by the new Copyright Act,[33] which became effective January 1, 1978. Under Section 102, 17

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[30] 409 U.S. at 73. "If these programs are to be patentable, considerable problems are raised which only committees of Congress can manage, for broad powers of investigation are needed, including hearings which canvas the wide variety of views which those operating in this field entertain. The technological problems tendered in the many briefs before us indicate to us that considered action by the Congress is needed." [footnote omitted]

[31] *See* U.S. Copyright Office Announcement SML-47 (May 19, 1964). Three conditions which software must meet for copyright protection are: (1) original authorship; (2) publication of copies in a form perceptible or capable of being perceptible to the human eye; (3) depositing copies for registration to consist of or include reproductions in a language intelligible to human beings.

[32] "Report by the National Commission on New Technological Uses of Copyrighted Works" (1977).

[33] P. L. 94-553, 17 U.S.C. § 101 *et seq.* (Oct. 19, 1976).

U.S.C. §102, copyright may be obtained, *inter alia*, for "literary works," which term is defined in Section 101, 17 U.S.C. § 101, as "works, other than audiovisual works, expressed in words, numbers or other verbal or numerical symbols, or indicia, regardless of the nature of the material objects . . . in which they are embodied." According to the legislative history of Section 101, this term "includes computer data bases, and computer programs to the extent that they incorporate authorship in the programmer's expression of original ideas, as distinguished from the ideas themselves." [34]

Of course, as the foregoing legislative history makes clear, the existence of copyright protection does not prevent someone from individually arriving at the same result through his own efforts, and a copyright can only protect the form of expression used in a particular program. Since experience has shown that the copyright law is a viable form of protection in marketing computer programs, Congress has authorized and funded a Presidential Commission [35] to study ways in which protection for computer programs could be strengthened under the copyright law.[36] A final report by the Commission is to be submitted to the President and Congress by July 31, 1978. Accordingly, if increased proprietary protection for computer programs is considered necessary, it will be accomplished through legislation and not through distortion of the patent laws.

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[34] H. R. Report 94-1476, 94th Cong., 2d Sess. 54 (1976).

[35] P.L. 93-537 (1974). Its name is the National Commission on New Technological Uses of Copyright Works (CONTU).

[36] 17 U.S.C. § 117.

V

CONCLUSION

For the foregoing reasons, CBEMA respectfully submits that the mathematical algorithm sought to be patented by respondent in this case is not eligible for patent protection and that the Lower Court's decision should be reversed.

Respectfully submitted,

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FOR ARGUMENT

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IN THE

Supreme Court of the United States

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No. 77-642

LUTRELLE F. PARKER, Acting Commissioner of Patents and Trademarks,

Petitioner,

v.

DALE R. FLOOK,

Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

BRIEF AMICUS CURIAE FOR MOBIL OIL CORPORATION

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1977

No. 77-642

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS,

Petitioner,

v.

DALE R. FLOOK,

Respondent.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

BRIEF AMICUS CURIAE FOR MOBIL OIL CORPORATION.

I.

THE NATURE AND INTEREST OF THE AMICUS.

This brief amicus curiae is submitted by Mobil Oil Corporation in accordance with Rule 42(2) of this Court. Letters of consent from both parties have been filed with the Clerk of the Court.

Mobil Oil Corporation has as its principal business the exploration for, production, refining and marketing of petroleum and products derived therefrom on a worldwide basis. As a supporting activity, Mobil has several research facilities in different parts of the country utilized for original research to develop the full potential of computer

applications in its various fields of activity. Mobil's computers are in twenty-four hour a day use to find petroleum, to control its refineries, to increase the yield of petroleum products, and to develop new processes for converting coal to liquid petroleum products such as gasoline. Its large expenditures in research and practical applications involving computer operation have given rise to proprietary information deemed of great value. Mobil has an extensive licensing program under which its patented proprietary technology is generally made available for use by others around the world. Computer related technology has not been included, however, because of uncertainty as to protection afforded by the patent laws.

II.

SUMMARY OF THE ARGUMENT.

A. The C. C. P. A. has carefully applied this Court's ruling in *Gottschalk v. Benson et al*, 409 U. S. 63 (1972), (hereinafter *Benson*). Digital computers are used in numerous arts and technologies, a variety of which have been considered by the C. C. P. A. since the *Benson* decision. No general rule of law can justly prescribe the patentability of all of them. Petitioner wrongly urges this Court to adopt a general rule of law denying patentability to all inventions which are implemented by digital computers.

B. In urging unpatentability, Petitioner uses an approach inconsistent with the well established principle codified in 35 U. S. C. § 103, that the invention as a whole must be considered in determining patentability. Petitioner would separate the inventor's original idea, or discovery from the mode of implementing it. In accordance with Petitioner's approach, this mode of implementation must be inventive in and of itself. This would rule out large numbers of important patents in which the inventor's idea or discovery

rather than its mode of implementation is the inventive contribution.

C. If the Petitioner's position is adopted, large segments of the useful arts would be excluded from protection under the federal patent statutes. These innovations would be protected, if at all, only under the proprietary rights laws of the various states. The disparity in protection, and attendant confusion as to whether protection exists in a given state, would unnecessarily limit the exchange of technology. The patent statutes should be construed as applying to all newly developed technologies unless Congress specifically excludes them from protection.

III.

ARGUMENT.

A. *Benson* Has Been Properly Applied by the C. C. P. A. in Many Appeals.

Digital computers are use in geophysical exploration [1], banking [2], graphic display [3], controlling systems of other computers [4], operating systems of oil refineries [5], data

1. *In re Christensen*, 478 F. 2d 1392 (C. C. P. A. 1973); 35 U. S. C. § 101 rejection affirmed by C. C. P. A.

2. *In re Johnston*, 502 F. 2d 765 (C. C. P. A. 1974); 35 U. S. C. §§ 101 and 103 rejections reversed by C. C. P. A.; *rev'd.* as to 35 U. S. C. § 103 rejection *sub nom. Dann v. Johnston*, 425 U. S. 219 (1976).

3. *In re Noll*, 545 F. 2d 141 (C. C. P. A. 1976); 35 U. S. C. § 101 rejection reversed by C. C. P. A.; *cert. denied* — U. S. —, 195 U. S. P. Q. No. 5, p. II.

4. *In re Chatfield*, 545 F. 2d 152 (C. C. P. A. 1976); 35 U. S. C. § 101 rejection reversed; *cert. denied* — U. S. —, 195 U. S. P. Q. No. 5, p. II.

5. *In re Deutsch*, 553 F. 2d 689 (C. C. P. A. 1977); 35 U. S. C. § 101 rejection reversed by C. C. P. A.

processing [6], catalytic cracking of hydrocarbons [7], controlling machine tools [8], aircraft navigation [9] and selling automobiles [10]. These arts were involved in ten appeals which the C. C. P. A. decided since this Court's decision in *Benson*. No general rule can justly prescribe the patentability of all of the foregoing technologies. The presence or absence of a programmed general purpose digital computer in a patent application claiming an innovation neither confers upon nor detracts from the patentability of that innovation. Nevertheless, the Patent Office has taken the position that *Benson* precludes patentability of all of the foregoing arts which use digital computers, a position reasserted by petitioner in this appeal. Petitioner is attempting to do the very thing which this Court so carefully guarded against in *Benson* when it stated:

> "It is said that the decision precludes a patent for any program servicing a computer. *We do not so hold.*" 409 U. S. at 71, (emphasis added).

Furthermore, in urging a broad proscription of patentability, Petitioner has ignored this Court's subsequent observation that the holding in *Benson* was "limited" to the patentability of the process in question. *Dann v. Johnston, supra,* 425 U. S. at 224.

The C. C. P. A. has carefully applied *Benson* on a case by case basis, eschewing the broad proscription of patent-

6. *In re Waldbaum*, 559 F. 2d 611 (C. C. P. A. 1977); 35 U. S. C. § 101 rejection affirmed by C. C. P. A.

7. *In re Flook*, 559 F. 2d 21 (C. C. P. A. 1977); *cert. granted sub nom. Parker v. Flook*, — U. S. — (1977) (No. 77-642).

8. *In re deCastelet*, 562 F. 2d 1236 (C. C. P. A. 1977); 35 U. S. C. § 101 rejection affirmed by C. C. P. A.

9. *In re Richman*, 563 F. 2d 1026 (C. C. P. A. 1977); 35 U. S. C. § 101 rejection affirmed by C. C. P. A.

10. *In re Warmus*, — F. 2d —, 195 U. S. P. Q. 234 (C. C. P. A. 1977); 35 U. S. C. § 103 rejection affirmed by C. C. P. A. without reaching rejection under 35 U. S. C. § 101.

ability urged by Petitioner. That court found patentable subject matter in five cases and found unpatentable subject matter in the remaining five cases. In these ten cases, the C. C. P. A. very carefully analyzed exactly what the applicants claimed. Only such a careful analysis on a case by case basis will enable the patent system to meet the constitutional mandate for advancing the useful arts. If this Court adopts Petitioner's position as set forth on page 18 of its brief, however, all of the careful analysis by the C. C. P. A. will be ignored by the Patent Office.

As one example of the problems and further appeals which would be engendered by such a holding, consider the patent application, assigned to amicus, and involved in *In re Deutsch supra,* n 5. That patent application relates to the computer control of a system of multiple plants, such as oil refineries. The C. C. P. A. unanimously found the subject matter claimed in the Deutsch application to be patentable. The Patent Office did not petition this Court for *certiorari,* but neither did the Patent Office issue the patent. Despite the fact that the C. C. P. A. handed down its decision on May 5, 1977, the Patent Office has not yet taken even preliminary steps toward issuance of the patent [11]. Action on this application and numerous other patent applications, which in all respects comply with the requirements for patentable subject matter, has been suspended pending a decision on the broad issue which the Petitioner would have this Court decide [12].

11. The Patent Office normally sends a Notice Of Allowance requesting payment of a fee. After payment of the final fee, the patent is printed and issued. 37 C. F. R. § 1.316.

12. As a further example of the manner in which the Patent Office has suspended proceedings, reference is made to *Ex Parte Ruehle*, Appeal No. 320-89, Pat. Office Bd. of App. Although the Board of Appeals agreed that early decisions on appeals are normally in the best interests of the parties and the public, it denied a petition to expedite a decision on an appeal relating to seismic

Amicus submits that *Benson*, as it has been carefully applied by the C. C. P. A., properly carries out the constitutional mandate to promote the progress of the useful arts.

B. An Inventor's Idea or Discovery Is Part of the Invention as a Whole and Must Be Considered in Determining Patentability.

Thousands upon thousands of patents have been granted to amicus and others on chemical, electrical and mechanical inventions in which implementation of the idea is perfectly clear from the idea itself. Petitioner argues that:

> "To merit monopoly protection, it is not sufficient that a claim embody a concrete, tangible application of a mathematical or scientific principle; it must also extend beyond the routine, conventional, or uninventive applications that follow once the applicant possesses the idea." Petitioner's Brief at 19.

This contention is antithetical to the law which has upheld the validity of numerous patents in which the inventor's contribution was a discovery or an idea. As just one example, compositions of matter useful in catalytic cracking of gasoline can usually be conventionally produced after the inventor discovers the composition. Petitioner argues that the means or mode for implementing the discovery must be unobvious, but this is completely contrary to the established principle, codified in 35 U. S. C. § 103, that *the invention as a whole* must be considered in

12. (Cont'd.)
exploration. As its reason, the Board stated that ". . . Parker v. Flook may have a substantial impact on the law governing the decision in this appeal." (Unpublished decision dated March 14, 1978).

determining patentability.[13] *Graham et al v. John Deere Co. of Kansas City et al*, 383 U. S. 1, 3, 32 (1965).[14] This Court has consistently considered the invention as a whole in determining patentability.

In *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, 261 U. S. 45 (1923), the patentee discovered that wrinkling and malformation of paper in a paper making machine that had baffled an entire industry for decades occurred because the stock did not flow fast enough at a critical point in the process. Eibel simply increased the pitch of the path of the stock to take advantage of the force of gravity to increase the flow rate. This Court upheld the patent, deciding that the patentee had made a patentable contribution in discovering the problem even though once discovered the solution was routine.

In *U. S. v. Adams et al*, 383 U. S. 39 (1966), a patent on a water activated battery was upheld. The implementation of this battery required only ordinary skill, but it was the idea that imparted patentability to the patent.

The invention as a whole, and not the particular form or language used to describe it, must be considered in determining the patentability of the subject matter involved in any particular case. If the subject matter is implemented with the aid of a computer, the appropriate

13. 35 U. S. C. § 103 provides:

> § 103. Conditions for patentability; non-obvious subject matter. A patent may not be obtained though the invention is not identically disclosed or described as set forth in § 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. See *Trio Process Corporation v. L. Goldstein's Sons, Inc.*, 461, F. 2d 66, n. 18a (3 Cir. 1972); *In re Aufhauser*, 399 F. 2d 275, 277 (C. C. P. A. 1968); *In re Conover*, 304 F. 2d 680, 683 (C. C. P. A. 1962); and *In re Roberts and Burch*, 470 F. 2d 1399 (C. C. P. A. 1973).

language with which to define this subject matter is mathematics, a language which the technologist utilizing the computer understands. Analogously, the biologist understands species named in Latin. Ergo, biological inventions often make use of Latin terms to define species. The language used to define an invention ought not to be dispositive of patentability—rather patentability should be judged by the invention as a whole, however, described. For example, many chemical process patents claim invention in controlling a particular process variable within specified limits. One acceptable way of claiming such might be "controlling the pressure of a reaction between 100 and 500 psi as a function of the reaction temperature." This could also be accurately written:

$P = f(T)$; from $P = 100$ p.s.i. to $P = 500$ p.s.i.

Whether a patent claim is written in prose or in mathematical format is not determinative of patentability.

> "While a scientific truth, or the mathematical expression of it, is not patentable invention, a novel and useful structure (process, machine, manufacture or composition of matter) created with the aid of knowledge of scientific truth may be." *Mackay Radio & Telegraph Co. v. Radio Corporation of America,* 306 U. S. 86, 94 (1939) (Parenthetical matter added from 35 U. S. C. § 101)

The inclusion of a mathematical relationship in a patent claim does not necessarily destroy patentability.

Petitioner's brief distorts the patent law by improperly expanding the limited holding of *Funk Bros. Seed Co. v. Kalo Inoculant,* 333 U. S. 127 (1948). In that case, the alleged invention related to a principle of nature. Principles of nature or natural phenomena, such as that involved in the *Funk* case, are not patentable because they are not related to the useful arts for which the Constitution mandates patent protection. Where the invention as a whole relates to a principal of nature, or a fundamental natural law, only the unobvious implementation is patentable, not the particular law itself. Where the invention relates to one of the useful arts, however, such as the catalytic chemical conversion of hydrocarbons involved in the case at bar, it is only necessary that the invention as a whole, including the idea or discovery, be unobvious.

C. Exclusion of a Broad Area of the Useful Arts From Protection Under the Federal Patent Statutes Will Be Detrimental to the Advancement of the Useful Arts.

The desirability of uniformity under a federal patent system is well stated in *Sears, Roebuck & Co. v. Stiffel Co.,* 376 U. S. 225, 230 (1964):

> "Thus the patent system is one in which uniform federal standards are carefully used to promote invention while at the same time preserving free competition."

Petitioner argues that *Benson* precludes patentability of substantial numbers of patents for computer implemented inventions.[15] If the Petitioner's position is adopted, the same situation will exist that existed with respect to sound recordings after *White-Smith v. Apollo,* 209 U. S. 1 (1908) precluded statutory federal copyright protection for these recordings. In the interim between *White-Smith v. Apollo* and passage in 1971 of the Federal statute providing copyright protection for sound recordings, the states were free to enact statutes providing protection for sound recordings. This Court noted that a copyright granted by a particular state had effect only

15. Petitioner's Brief at 24. Petitioner estimates the number of such applications to be 600 to 900 now pending with approximately 450 such applications being filed each year.

within its boundaries, thus having no coercive effect on "record or tape piracy" outside of those boundaries. *Goldstein v. California,* 412 U. S. 546, 558 (1973), reh. den. 414 U. S. 883. The analogy between the exclusion of sound recordings from the copyright laws before 1971 and the potential exclusion of "new technology" from the 1952 Patent Act, as argued for by petitioner, is too strong to be ignored.

If a broad area of computer implemented technology is excluded from protection under the federal patent statutes, the only proprietary rights in this technology will be under such laws as the various states may enact.[16] The result of this varied protection will be a burden upon interstate commerce as well as a detriment to the American economy. If Petitioner's position is adopted, the states presumably would be free to enact laws extending beyond the normal trade secret type of protection. This Court has previously held that:

> "The only limitation on the States is that in regulating the area of patents and copyrights they do not conflict with the operation of the laws in this area passed by Congress . . ." *Kewanee Oil Co. v. Bicron Corp. et al,* 416 U. S. 470, 479 (1974).

16. While the Federal Copyright Law may provide some nationwide protection for computer programs, the protection extends only to the particular form of expression of the particular computer program and not to the underlying technical advance expressed in different form. Moreover, the reasoning of *White-Smith v. Apollo* might be applied to find that the Copyright Act of 1978 does not extend protection to each use of a program in physical form in a machine. The new copyright act provides that copyrighted matter fixed in physical form is a copy, but 17 U. S. C. § 117 provides that existing law will be applied notwithstanding other provisions of the statute. Many questions remain as to the application of this new act to computer technology. A commission to study changes in the copyright laws relating to protection of computer programs is currently at work, but it is by no means certain when and if Congress will act on its recommendations.

Kewanee reconciled the potential conflict between federal patent laws and state proprietary rights laws. *Kewanee* also recognized that some inventions which do not meet the standards of patentability set forth in 35 U. S. C. § 101 are protectible only under state law. The situation clearly cries out for broad construction of 35 U. S. C. § 101 to include as much technology as possible under the federal patent laws. Such a construction will help prevent conflict between federal and state laws.

The uses made by this amicus, and almost all other uses of computer technology extend beyond the confines of a single state. To rely solely on the trade secret protection of multiple states (or upon patent-like statutes which the states might enact) would unnecessarily complicate and restrict the disclosure and transfer of proprietary information about this technology. A better approach is recognized in *Kewanee*. Federal patents should be granted to encourage disclosure of those inventions which are so meritorious that they meet the standards of 35 U. S. C. § 103. Trade secret protection would be available to encourage investment in the areas of doubtfully patentable and clearly unpatentable technologies.

Petitioner, having already decided that the patent laws are not applicable to computer implemented technology, suggests at page 25 of its brief that Congress provide some other form of protection.[17] If it is necessary to await Congressional action, confusion as to the nature

17. Congress has considered legislation making computer programs unpatentable. H. R. 5924, proposed, 35 U. S. C. § 106, 90th Cong., 1st Sess. (1967) provided:

> "Computer Programs Not Patentable: A plan of action or set of operating instructions, in whatever form presented, to cause a controllable data processor or computer to perform selected operation shall not be patentable."

This legislation was proposed and hearings were held, but the legislation was not adopted. Similar legislation has not been subsequently proposed.

and scope of protection will exist in the interim. The better reasoned approach is to construe the patent statutes as applying to all areas of technology unless Congress specifically excludes a given area from patentability.

We are presently witnessing man's entry into exciting new areas of technology.[18] Are the patent statutes to be so narrowly construed that this Court must decide whether each of these new technologies is statutory subject matter? If the narrower approach is taken, the patent laws could be construed as not applying to many important new technical advances in our rapidly changing technology.

IV.

CONCLUSION.

American jurisprudence is built upon the principle of adaptability. Much of today's commonplace technology was the science fiction of 1952; much of tomorrow's technology would seem like science fiction today. This Court should not construe the 1952 Patent Act so meanly and narrowly as to require Congress to reenact it as each previously uncontemplated technology emerges.

Respectfully submitted,

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18. For example, consider the creation of new living organisms. See *In re Bergy*, 563 F. 2d 1031 (C. C. P. A. 1977) and *In re Chakrabarty*, — F. 2d —, 369 BNA-PTCJ D-1 (C. C. P. A. 1978). The PTC Journal comment on page A-3 refers to the filing by the Government of petitions for certiorari in both cases.

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IN THE

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October Term, 1977
No. 77-642

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS,

Petitioner,

vs.

DALE R. FLOOK,

Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

BRIEF AMICUS CURIAE FOR SOFTWARE ASSOCIATES, INC.

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LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS,

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On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

BRIEF AMICUS CURIAE FOR SOFTWARE ASSOCIATES, INC.

I.
The Questions.

Three principal questions are presented by this case.

Question No. 1

Is Flook's claimed invention to a mathematical equation or is it to a petroleum refining process which has been modified in accordance with a mathematical equation?

Question No. 2

Is a claim nonstatutory if the mathematical aspects of a relationship involved in the claim may be carried out by means of a computer?

Question No. 3

Is programming of a general purpose digital computer in accordance with a mathematical algorithm always unpatentable?

The first question is not faced by either the Petitioner or the Amicus CBEMA.[1] They both assume an answer to the first question, believed to be incorrect by Amicus. The second question is raised indirectly in the briefs of both the Petitioner and the CBEMA. The third question is touched upon lightly by the Petitioner, but answered in the negative by CBEMA.

II.
Consent.

Software Associates, Inc. has received consent from both parties to file this brief amicus curiae. The letters of consent have been filed with the Clerk of the Court.

III.
Interest of Software Associates, Inc.

This Amicus, Software Associates, Inc., is a small corporation located in Altadena, California and engaged in the manufacture of software for a wide variety of customers. Amicus believes that it is typical of thousands of other small companies engaged in software manufacture.

Amicus has no interest in Flook's patent application and does not consider itself prepared to form a judgment as to whether or not the invention described and claimed there is unobvious over the prior art.

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[1]The following abbreviations are employed in this brief: "Pet. Br." refers to brief of the Petitioner; "CBEMA" refers to the Computer and Business Equipment Manufacturers Association; "CBEMA Br." refers to the brief of the CBEMA.

However, Amicus believes that it is qualified to be of assistance to the Court in its consideration of mathematical equations, mathematical algorithms, computer algorithms, and the manner in which they may be related to other parts of mechanical, electrical, and chemical devices and systems.

Because of the uncertain status of the patent law, at least as it appears to the software industry, Amicus has not sought to protect any of its products under the patent laws. Discouraged, Amicus, like many other similar companies, relies upon the law of trade secrets and the law of contracts in order to protect whatever proprietary rights that it has.

Amicus is familiar with the benefits that small companies derive from the United States patent laws in other fields. By obtaining patents on their inventions, small companies in other industries are given an opportunity to grow, and sometimes do succeed in growing. Amicus believes that companies engaged in software manufacture deserve to benefit from the patent laws to the same extent as companies in other industries, when they make meritorious inventions.

Amicus is familiar with *Gottschalk v. Benson*, 409 U.S. 63 (1972) and is also familiar with many of the practices of the United States Patent and Trademark Office. Amicus is confused by the interpretation that the Petitioner and CBEMA have placed on *Gottschalk v. Benson, supra,* and is dismayed by the prospective costs and difficulties of obtaining a patent on an invention that involves computer programming and especially by the prospects that a patent may not be obtained at all without the inventor being forced to bring the application up to the Court of Customs and Patent

Appeals and even all the way up to this Court for review. This is especially so since 5 cases have been decided by the Court of Customs and Patent Appeals in favor of patent applicants since the decision in *Gottschalk v. Benson, supra,* was rendered by this Court, and of these 5 cases, the Petitioner has sought to have the decisions of the Court of Customs and Patent Appeals set aside by this Court in 4 of them.[2] The only exception is *In re Deutsch,* 553 F. 2d 21 (1977).

Amicus recognizes that the Petitioner has stated the issue in this case in terms of a mathematical equation but Petitioner has also indirectly raised the issue as to whether any invention at all would be patentable if in the course of practicing the invention a mathematical equation is programmed into a computer and the programmed computer is used as part of a larger system.[3]

Amicus submits that the programming of mathematical equations or mathematical algorithms into a computer to form machine algorithms can so alter the mode of operation of the computer or of the system in which it is used, that the combination that involves such programming of a computer may be sufficiently meritorious to deserve patent protection and that any contrary conclusions would be injurious to the public welfare.

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[2]*In re Noll,* 545 F. 2d 141 (1976); cert. den. 54 L.Ed. 2d 155. *In re Chatfield,* 545 F. 2d 152 (1976), cert. den. 54 L.Ed. 2d 155. *In re Flook,* 559 F. 2d 21 (1977), cert. granted ..... F. 2d ..... *Dann v. Johnston,* 425 U.S. 219.

[3]Pet. Br., p. 23.

IV.

General Argument.

It is the view of Amicus that Question No. 1 should be answered in favor of the proposition that Flook's claim (*infra,* pp. 20-21) is for a petroleum refining process which has been modified in accordance with a mathematical equation, thus rendering Flook's claim proper under 35 U.S.C. 101.

The Petitioner and the CBEMA have not faced up to Question No. 1 but have asserted, without proof, that Flook's invention resides *solely* in the mathematical equation that he employs for modifying the last step of his process.

Flook claims a new method of regulating a system involving the catalytic chemical conversion of hydrocarbons in which the last step is related in a new way to conditions detected in the performance of the process. The new relation, which is set forth in the last step, is related to observations made of the process as expressed in the form of a mathematical equation. But this equation is neither a mathematical algorithm nor a machine, or computer, algorithm.

Both Petitioner and CBEMA seem to concede that the Flook claims define statutory subject matter if the invention is in the petroleum processing method and not solely in the mathematical equation employed by Flook in his process.

So the real issue in this case is one of fact. It is submitted that this fact issue should be resolved in favor of Respondent.

Even if the decision of this Court is to the contrary with respect to Question No. 1, it is the position

of Amicus that decisions on Questions No. 2 and No. 3 should be in the negative.

Furthermore, the arguments of Petitioner and the CBEMA are somewhat confusing and misleading because they have not distinguished the meanings of important terms.

Part of the difficulty resides in the fact that various people, including particularly the CBEMA, often disregard distinctions between a mathematical algorithm and a machine, or computer, algorithm. Both the Petitioner and the CBEMA, especially the former, also fail to distinguish an algorithm from a mathematical equation. The meanings which they attribute to these words appears to shift throughout their arguments, and they refer to various parts of the *Benson* case without taking these important distinctions into account.

In an effort to clarify some of the problems presented by this case, this brief will emphasize the facts that are involved in the various cases discussed, both this case and in precedent cases, so as to bring out the relationship between the *claimed* subject matter of this case and the *claimed* subject matters of prior cases.

Petitioner has dissected Flook's claims and has found fault with them part by part. Such dissection is not permissible under 35 U.S.C. 102 or under 35 U.S.C. 103 and should not be permitted under 35 U.S.C. 101.

In any event, contrary to the apparent assumptions of Petitioner and the CBEMA, programs, at least machine programs, constitute patentable subject matter under the present patent statute.

Under all the authorities taken as a whole, a claim should not be held to be nonstatutory merely because it involves relations that are expressed by a mathematical equation or by an algorithm of any kind.

V.

Mathematical Equations and Algorithms Need to Be Distinguished and They May Involve Invention, Especially When Programmed Into a Machine.

It is believed that it will be helpful in understanding the present invention, the *Benson* case, and a number of the precedent cases cited hereinafter, if the terms "mathematical equation", "mathematical algorithm", and "computer", or "machine", "algorithm" are distinguished.[4]

It was correctly recognized by this Court in *Gottschalk v. Benson, supra,* that an algorithm is a procedure for solving an equation. In other words, a mathematical equation is not an algorithm. This important distinction is not taken into account by either the Petitioner or the CBEMA.

A mathematical equation may express relations between values that represent physical phenomena. As will be seen, these relations are commonly of two kinds, algebraic, or quantitative, relations and logical relations.[5] Both types of mathematical relations are important in computer programming technology.

---

[4]For simplicity we use the term "machine algorithm" to refer to a program that is stored in a machine and which causes the machine to carry out a sequence of operations when the machine operates. And we use the term "mathematical algorithm" to refer to a procedure for solving a mathematical problem with the aid of pencil and paper or just in one's head.

[5]The mathematics of logical relations is involved in "modern math".

A procedure for solving an equation may be a pencil and paper, i.e., a mental, process or it may be a mechanical or electrical process. In the field of modern computer technology, an algorithm that operates within a computer involves a step-by-step series of changes of states of electrical or magnetic elements. Programming a computer to solve a mathematical equation also involves changing states of such physical elements.

The term "algorithm" is used in the computer art almost as a synonym for any kind of a program in or for a computer. And sometimes a mathematical equation is called an algorithm. Hence, there is a need to use the term "algorithm" with caution. It might be a printed program for making calculations step-by-step, in accordance with a mathematical algorithm. It may also be a printed listing of a series of instructions that are to be programmed into a computer to alter its internal structure and functions by changing states of magnetic or electrical elements. Such a list of instructions is sometimes known as software. (But software is a generic term with additional meanings.) But it might also be in machine form within a computer to cause the computer to perform a series of steps in a predetermined sequence.[6] The actual sequence that is followed may vary from time to time depending upon the values of the variables supplied to the computer.

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[6]Knuth, Don E., *Art of Computer Programming*, Vol. 1, pp. 1 ff (Addison-Wesley, Redding PA, 1974); see also Ralston, Anthony, et al., *Encyclopedia of Computer Sciences*, pp. 47-48 (Petrocelli/Charter, New York 1976).

Computer algorithms make use of logical equations as well as ordinary algebraic equations and the various parts of a computer that are affected by algorithms are often referred to as logic elements.

The equation

$$V = LWH \qquad (1)$$

and the equation

$$L = S_1 S_2 S_3 \qquad (2)$$

represent the two forms of the aforementioned equations. Equations (1) and (2) are both mathematical equations of the kind to which the statements of the Petitioner and the CBEMA seem to refer. Though equations (1) and (2) are identical in form, they may represent entirely different physical concepts. They may even be subject to entirely different mathematical laws. Thus, equation (1) may represent an algebraic or quantitative relation, whereas equation (2) may be a logical relation. We will illustrate the difference.

In the field of ordinary algebra, equation (1) may be employed to represent the rule that the volume (V) of a box is obtained by multiplying its length (L) by its width (W) and then multiplying the resultant product by the height (H) of the box.

But in the field of Boolean algebra, which is a branch of symbolic logic, the second equation may represent the proposition that a signal circuit (L) for turning a light on and off is closed only when all three switches S1, S2, and S3 in series are closed.[7]

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[7]The underlying concept was first suggested by Charles S. Pierce, the founder of the philosophy of pragmatism, in a letter written in 1879 (see Eames, Charles and Ray, *A Computer Perspective*, p. 33 (Harvard University Press, 1973)).

Equation (2) is now called a logical product, and the circuit in which it is connected is sometimes referred to as an AND gate. Modern computers use AND gates and other somewhat similar devices, such as OR gates and NOT units, but of a somewhat more sophisticated kind. But they are still essentially switching circuits.

A modern binary digital computer consists of many logic units, such as AND gates, OR gates, and NOT units and of many subassemblies, such as storage registers, shift registers, counters, coders, decoders, and the like, which themselves are made up of such elementary logic units. They also include memory units and a sequence controller.

In such a computer, certain memory units are employed for storing programs temporarily by means of "software" operations and other memory units called "read only memory" (ROM) units have sections of programs stored in them, often permanently. (Some ROM units are also reprogrammable under special conditions.) The former involves "software" programs. The latter involves "firmware" programs. The terms refer in part to the ease with which a program may be changed in the machine.

When such a digital computer is programmed, machine instructions are created in a memory unit by software. Such instructions are retained in the memory unit for later use when selected by the sequencer. When the program operates, the sequencer fetches these instructions one at a time. When each instruction is fetched, it causes an operation to be performed, such as a "logical product" operation or an arithmetic "add" operation. Normally, many of the instructions cause

various parts of the computer to operate in accordance with logic equations even when the computer is programmed to solve an ordinary algebraic equation.

The machine instructions are stored in a programmed sequence, such that when the sequencer fetches them, various operations occur in a predetermined sequence depending upon the conditions that exist in the computer at that time as a result of input data and prior operations caused by carrying out steps in the algorithm. In effect, each instruction causes various machine elements to be enabled or disabled to carry out the operation desired.[8] In programming a computer to solve a mathematical equation, a machine algorithm is established in a memory unit to carry out a procedure in which the computer performs a sequence of operations one step at a time and then finally ends up with a solution to the problem. But computers do not only solve mathematical problems. Quite usually the program is set up to relate the computer and some of its operations to external parts of a larger system in a special way and to cause various parts of the larger system to be interconnected and to operate upon each other in a manner determined by the machine algorithm.

Each time such a computer is programmed, the set of instructions previously stored in the computer is, in effect, erased or destroyed and a new set of instructions is stored, thus enabling the computer to function in a different way when operating with the new program than it did with the prior program.

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[8]Huskey, Henry D., et al., *Computer Handbook*, Sec. 16 "Digital-Computer-System Design" and Sec. 20 "General Purpose Computers" (McGraw-Hill Book Co., New York 1962); Murphy, John S., Basics of Digital Computers (John F. Rider Publisher, Inc., 1958), pp. 76-84.

In actual practice, in modern binary digital computer technology, a mathematical equation can be fed into a computer from punched cards, from a remote typewriter-like keyboard, or from a coded magnetic tape or disc, to construct a computer algorithm that carries out a procedure for solving the equation. Normally, when this is done, the equation fed in is processed by means of what is known as a "compiler" and translated into the machine, or computer, algorithm. This machine algorithm is usually generated automatically by the compiler for solving the equation. So long as this is all that is done, it could be argued that the inventor has made no patentable invention.

But the inventor often does more. This could occur, for example, if the computer is employed to regulate a petroleum refining process in a new way, as in Flook's case. It could also occur if the compiler or computer or both, function in a new and unobvious way. It could also occur if the inventor develops a new and unobvious kind of compiler or a new and unobvious kind of memory bank or a new data processing unit. It could also occur where the inventor first converts his mathematical equation into a partial mathematical algorithm and then feeds the mathematical algorithm through a compiler to the computer to create a new and unobvious machine algorithm which solves the original mathematical equation in a particularly efficient, or reliable, way. The possibilities are endless. The Petitioner seems to urge that none of these can constitute statutory subject matter.

The system of programming described above involves what is called a stored program. In fact, we have emphasized programs that are only temporarily stored. As mentioned above, some programs and parts of programs are stored permanently in magnetic or electrical elements. Programming, however, may also be accomplished with the aid of plug boards and with permanent wiring.[9] In a computer of the stored-program type, in effect, the program is created by changing the states of memory elements, and the program is carried out by changing the states of other elements to provide, in effect, electrical connections between various computer elements to carry out the various operations called for by the stored-program.

The actual machine algorithm created by software programming of a computer depends upon the construction of the machine and the nature of the programming method, and in the case of stored programs, upon the nature of the compiler. The key though to the determination of the principal related computer function is in the mathematical equation itself, or in the particular mathematical algorithm for establishing a particularly efficient procedure for solving the equation.

In ordinary operations, the mechanical arrangement of the various elements of the computer remains fixed, even though the states of these elements are altered by programming and even though the states of the elements are altered sequentially during operations. It is well established that invention may be involved in a system in which changing electric currents represent information. *The Telephone Cases,* 126 U.S. 534 (1887).

No one could possibly know at the present time all the ways that the action of the general purpose binary digital computer could perform with the programs that have not yet been invented. Hence, it would

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[9]Huskey, et al., see Footnote 8.

be dangerous to deny the benefits of the patent laws to all inventions that involve mathematical relations or programs.

VI.

A Claim Should Not Be Rejected Merely Because It Involves Mathematical Relations or Algorithms.

It has long been recognized that mathematical terms may be employed for helping to define an invention in the claims.[10] And this Court has sustained claims that involved a mathematical equation, either expressed or implied, to help define an invention, regardless of the novelty of the equation.

An apparatus claim may be defined by reference to relations between parts. A process claim may be expressed in terms of steps, conditions under which the steps are carried out, and how the steps are related to each other. The relations may be expressed by mathematical equations.

In *MacKay Co. v. Radio Corp.*, 306 U.S. 86 (1939), this Court upheld the decision of a lower court holding claims to a radio antenna valid when the relative positions of old parts of the antenna were defined in terms of an old mathematical equation. Clearly, the patent was for an antenna, not for a mathematical equation per se. Under the Petitioner's view, the claim would be nonstatutory since, he would argue, the "sole novelty of the claim consists of the mathematical equation". Actually, the invention was in the relationship of the parts, which relationship could best be expressed by a mathematical equation.

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[10]Stringham, Emerson, *Patent Claims, A Drafter's Manual*, Section 5513 (Pacot Publications, 1941); Rules of Practice of U.S. Patent and Trademark Office 1.58, 1976 (37 F.R. 21995, Oct. 18, 1972).

In *Faulkner v. Gibbs*, 338 U.S. 267, claims to a game were held valid. The claims involved electrical circuitry that solved an unexpressed mathematical equation.[11] The *Gibbs* patent claimed a marble game machine, the kind that had a spring switch beneath each of 25 holes on a sloping board, into which marbles were shot one at a time. The holes were arranged in a 5x5 square pattern in the shape of a BINGO card.

In this particular case, the machine solved a number of mathematical equations. A typical equation that was solved by the machine involved a logical product of the kind mentioned above, except that there were five switches that had to be closed for a particular light circuit to close. Such a mathematical equation would be of the form

$$L = S_1 \cdot S_2 \, S_3 \, S_4 \, S_5$$

---

[11]Claim 9 of Gibbs Patent No. 1,906,260 held valid by the Court below (170 F. 2d 34, CA9) reads as follows:

> "9. A game apparatus comprising a plurality of electrically connected units, each including a game board with a plurality of apertures therein, and an annunciator with a plurality of indicators thereon, electrical contacts adjacent each of said apertures connected in the circuits of said indicators, said indicators and said apertures corresponding in number and subdivided into corresponding groups, whereby when objects are deposited in said apertures by the players at the several units, corresponding indicators will be energized, a supplementary signal circuit on each of said units, and *AND means for holding said signal circuit open until all of the indicators of any group on each of said units have been energized, and for closing said signal circuit when all of the indicators of any unit have been energized,* and means controlled by the closing of the signal circuit of the winning unit for discontinuing the signals and opening the circuits of the indicators on all other units." [Italicizing and capitalized word AND have been added for clarity.]

The italicized portion sets forth a logical product of the type of equation (2) set forth above.

A number of such equations could be used to describe the function of an ordinary game board of the BINGO type. When the problem was solved, lights remained operated to indicate that balls had entered five holes in a row of the 5x5 array. A number of game boards were operated simultaneously by competing players and NOT units opened circuits of the losers when an AND circuit of the winner was closed.

In the *MacKay* case, the equation was of the ordinary algebraic type. In the *Faulkner* case, no mathematical expression was set forth, but the operation could be described in terms of a mathematical relation of the kind known as a logical product. Over 2000 years ago, Pythagoras taught that all phenomena could be described in mathematical terms. In both the *MacKay* case and in the *Faulkner* case, the claims would have been pulverized to dust if the claims had not been considered as a whole and held together by the mathematical relations as limitations, whether expressed in formula form or whether described in words.

The claims of the *MacKay* case provide a perfect example of what would happen if the mathematical equation set forth in a claim could be disregarded. Nevertheless, the validity of the claim was upheld. Clearly, the reason for this is that combining the old parts in accordance with the old equation created a new and unobvious structure in which the old parts were interrelated in a new way.

The *Benson* case did not overrule *MacKay* or *Faulkner* but applied only to a set of claims which could be infringed without the use of any apparatus at all (*Gottschalk v. Benson*, 409 U.S. 63 (1972)).

The *Benson* case helped draw a line between a claim to a mathematical algorithm for solving an equation and a claim to a combination of a plurality of physical elements that were expressly, or inherently, interrelated in a mathematical manner.

Accordingly, these three cases of this Court taken as a whole must mean that a claim to a process is not nonstatutory merely because a step of a claim is carried out in accordance with an equation or with the aid of either a mathematical algorithm or a machine algorithm.

It is reasonable to apply the rules of *MacKay* and *Faulkner* to process claims.

At page 12 of his brief, the Petitioner treats mathematical formulae and algorithms the same as abstract ideas and scientific principles and phenomena of nature. It is well established that a claim constitutes statutory subject matter even if it involves an invention that is an application of a mathematical equation, an abstract idea, a scientific principle, or a law of nature. *MacKay Co. v. Radio Corp., supra; Faulkner v. Gibbs, supra; O'Reilly v. Morse*, 15 How. 62; *The Telephone Cases, supra; Gottschalk v. Benson, supra.*

Accordingly, the decision of the CCPA is consistent with the law of all prior cases of this Court.

VII.

Benson's Claims Were Directed to a Mental Process and Not to a Process of Programming.

The *Benson* case is to be construed narrowly, not broadly in the manner sought by Petitioner and the CBEMA. *Dann v. Johnston,* 425 U.S. 219, 224.

In holding Benson's claims nonstatutory, the Court pointed out that the *claimed* invention "could be performed *without any apparatus*" at all. In other words, the *Benson* case was concerned only with whether a particular, simple mathematical algorithm (not a machine algorithm) was statutory subject matter.

This conclusion can be understood only if it is recognized that the term "re-entrant register" used in Benson's claim 8, was non-apparatus. This indeed was the case[12], and this was recognized by this Court and distilled in the simple statement quoted above. As explained more fully by this Court, Benson's claims were not limited to any particular art or technology, to any particular apparatus or machinery, or to any particular end use, and the claimed process did not operate to change articles or materials to a "different state or thing". In other words, Benson's claims could be infringed by a mental process alone.

A study of the *Benson* case therefore makes it clear that the *Benson* case was not concerned with programming of a computer or with the resultant programmed computer and certainly not with any relation of a mathematical equation or of a programmed computer to other parts of a claimed process or apparatus.

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[12]Lawlor, Reed C., "Benson and Beyond", *Computer Law Service,* Sec. 4-2, Art. 3 (Callaghan, 1975), pp. 11-14.

VIII.

Programs Are Patentable Under the Present Patent Statutes.

The Petitioner seems to urge (Pet. Br. p. 23) that "the patenting of computer applications of mathematical algorithms" is not permissible under present law. The CBEMA seems to make the same assumption, at least up to a point (CBEMA Br. pp. 4, 15-16). Their viewpoints are based in part upon a misinterpretation of the present patent statutes, and the Report of the President's Commission, *infra,* and the *Benson* case, *supra.*

It is the position of Amicus that computer programs, though not mentioned, *in haec verba,* in the statute, clearly constitute patentable subject matter under the present patent law.[13]

That programs are patentable under present law was not denied by the President's Commission on the Patent System in 1967, and sharply pointed out by William E. Schuyler, the Commissioner of Patents in 1969.

In its report,[14] the President's Commission proposed that a *new* patent law be enacted in which

> "The classes of patentable subject matter *shall continue as at present, except*
>
> . . .
>
> A series of instructions which control or condition the operation of a data processing machine, generally referred to as a 'program' shall not be considered patentable . . ." [Italics added.]

---

[13]Public Law 593-82nd Congress, 2nd Session; United States Code, Title 35.

[14]Report of the President's Commission on the Patent System, November 17, 1966.

William E. Schuyler, while he was Commissioner of Patents, summarized it this way,

> "The President's Commission to study the patent system recommended that computer programs be *excised* from the patent system". [Italics added.][15]

Attempts to change the law (*e.g.*, S1042, 89th Congress, 2nd Session) in order to excise computer programs from the classes of statutory subject matter have been rejected by Congressional Committees. It is therefore believed to be clear that computer programs are patentable under current law.

However, perhaps, as recommended by this Court in *Benson*, Congressional action is needed if statutory protection is to be extended to purely mathematical algorithms of the kind that are not limited "to any particular art or technology, to any particular apparatus or machinery, or to any particular end use", and which are "so abstract and sweeping . . . [that] the end use may . . . be performed . . . without any apparatus" at all.

IX.

It Is Improper for the Petitioner to Dissect Flook's Claims and Then to Reject the Segments One Segment at a Time.

Flook's claim 1 reads as follows:

> "1. A method for updating the value of at least one alarm limit on at least one process variable involved in a process comprising the catalytic

[15]Schuyler, William E., Jr., "Protecting Property in Computer Software", reprinted from *The Law of Software* (George Washington University, 1969) in 3 *Computer Law Service*, Sec. 4-1, Art. 4.

> chemical conversion of hydrocarbons wherein said alarm limit has a current value of
>
> Bo + K
>
> wherein Bo is the current alarm base and K is a predetermined alarm offset which comprises:
>
> (1) determining the present value of said process variable, said present value being defined as PVL:
>
> (2) determining a new alarm base B1 using the following equation:
>
> B1 = Bo(1.0-F) + PVL(F)
>
> where F is a predetermined number greater than zero and less than 1.0;
>
> (3) determining an updated alarm limit value which is defined as
>
> B1 + K; and, thereafter
>
> (4) adjusting said alarm limit *to said updated alarm limit value*." [Italicizing added.]

The Petitioner argues that there is no novelty in the refining process, but only in the mathematical equation. In this he ignores the novel relationship established between the steps of the process.

What Petitioner does, is dissect the last step (4) of the Flook claim into two portions, one of which is underlined above and the other of which is not underlined. In considering the novelty of Flook's contribution, Petitioner then ignores the underlined portion because the updated value referred to there was calculated by use of a mathematical formula referred to earlier in the claim, and then he declares that the remainder of that last element is not new, and hence that the entire claim is old. At the very best,

that is an untenable, unsupported rejection under 35 U.S.C. 103.

Dissection of any step of a claim amounts to dissection of the whole claim. Such dissection is forbidden by 35 U.S.C. 103. For it is the claim as a whole which must be considered, not the individual parts (35 U.S.C. 103).

Most, if not all, claims refer to old parts, old properties, and old relations. If a claim is to be declared inappropriate for consideration under the patent law because there is some objection to each of the individual parts separately, all patents and the patent law itself would be destroyed one part at a time.

Such destruction would not be limited to mathematical relations or mathematical algorithms, or computer algorithms. It would cut across all other technological arts as well.

A claim represents a bundle of features, namely, parts, steps, properties, relations, conditions, and the like. The strength of the bundle is greater than the strength of the individual parts and hence may be patenable, especially in an electrical or chemical case, *Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147 (1950). What Petitioner does is seek to destroy the fagot, stick by stick. Just as this practice has been condemned in the trademark law, *Joseph Schlitz Brewing Co. v. Houston Ice & Brewing Co.*, 250 U.S. 28 (1919), it should also be condemned in the patent law.

The Court of Customs and Patent Appeals has expressed its views on this very point in the case of program-related inventions, in *In re Chatfield, supra,* in these words:

> "Our references in Christensen to the mathematical equation as being 'at the point of novelty' does not equate to a holding that a claim may be dissected, the claim components searched in the prior art, and, if the only component found novel is outside the statutory classes of invention, the claim may be rejected under 35 USC 101. That procedure is neither correct nor within the intent of Congress, for the reasons we stated in Bernhart."

The Petitioner, in dissecting the claim into separate sticks, urges that a patent on the fagot would be a patent on each stick separately, and then jumps to the illogical conclusion that since a mathematical equation is one of the sticks of Flook's claim, a patent on the fagot would be a patent on the mathematical equation.

The Petitioner seeks to destroy the bundle represented by a claim by destroying one feature at a time. Such practice is not permitted under 35 U.S.C. 102 or under 35 U.S.C. 103. And it should not be permitted under 35 U.S.C. 101.

Dissection of a claim into sticks to destroy the fagot should not be condoned by this Court.

Flook does not seek a patent on the mathematical equation but only on his method of setting alarm limits for a chemical process by adjusting those limits in accordance with a determination made with the aid of a mathematical equation and prior determination of the state of the process.

X.

Important Computer Programs Are Not Freely Available at the Present Time but Are Sure to Become Freely Available Only if They Are Patented.

CBEMA strongly implies[16] that there has been a free interchange of computer programs throughout the history of the computer industry. This is simply not so with respect to important programs.

At the present time, important programs are guarded in secrecy, largely because the Petitioner refuses to recognize their merit from a patent standpoint.

One author puts it this way,

> "Trade secret law is by far the most widely used method of attempting to secure legal protection for software".[17]

Reliance on trade secret protection has continued to grow since that article was written. And lawyers even recommend that clients who mark their programs with statutory copyright notices, also treat the programs as trade secrets.[18] The notice preserves copyright if and when the secret is lost.

If programs are patented, then they will become freely available to the general public after the expiration of the 17-year grant provided under the patent law. If they are published and covered by copyright, they will become freely available after about 75 years. But since neither patent protection not copyright protection

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[16]CBEMA Br. 17-21.

[17]Bender, David, "Trade Secret Protection of Software", *38 George Washington Law Review*, July 1970, p. 909, reprinted in 3 *Computer Law Service*, Sec. 4-4, Art. 2.

[18]Myers, Edith D., "Should Software be Copyrighted?", *Datamation*, Vol. 24, No. 3, March 1978.

is considered adequate by American business at the present time, large numbers of important programs are maintained in secrecy, Manufacturers of computers (without doubt including many computer-manufacturer members of CBEMA) are particularly zealous to preserve their programs in secrecy[19] and do not make them available on a free interchange basis.[20]

XI.

The Availability of Copyright Protection for Computer Programs Does Not Justify Holding That Inventions That Utilize Machine Programs Are Non-statutory.

CBEMA states that computer programs are copyrightable. Amicus agrees. Though no court has passed on this question, program listings are believed to be copyrightable under the new law, as explained by CBEMA, as well as under the old law. However, other provisions of the new Copyright Act, which became effective January 1, 1978, are in a state of suspension (17 U.S.C. 117), and it has been reported that CONTU plans to recommend against extending the benefits of the new law to computer programs.[21] It is implied by CBEMA that since copyright protection is available

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[19]A typical agreement reads in part as follows: ". . . All programs furnished by . . . shall remain confidential and proprietary property of . . . Customer agrees to continue to treat such information as confidential and proprietary property of . . . and shall acquire no rights in them except to use such information solely for the purpose of and only during the time it uses the equipment or for the period covered by any license fee. Etc.", 3 *Computer Law Service*, App. 3-2d, No. 3, p. 13.

[20]See the foregoing agreement and another at 3 *Computer Law Service*, App. 3-2b, No. 51, pp. 105, 106.

[21]*Computerworld*, Feb. 27, 1978; See also, Myers, Note 18, *supra*, p. 132.

for computer programs, patent protection should not be.[22] Amicus cannot agree with this conclusion.

To argue that computer programs should not be patenable because copyright protection is available for program writings as works of authorship would be like arguing that computer circuits should not be patentable because drawings of computer circuits are copyrightable.

The requirements for copyrightability and for patentability are entirely different, the terms are entirely different, and the rights established by issuance of a certificate of copyright and by issuance of a patent are entirely different.

Copyrights are obtainable for programs that are not new so long as they involve originality. Patents should be obtainable for inventions that involve machine programs if they meet the usual standards of novelty (35 U.S.C. 102) and non-obviousness (35 U.S.C. 103).

The parts of a general purpose digital computer are interrelated in a new way when it is reprogrammed. In some respects, a general purpose digital computer is like a toy of a kind with which children play, such as an Erector set, a Mechano set, or a Tinker Toy set, and that can be employed for constructing various objects. Patents issue on such sets, and parts thereof, and instructions are usually supplied to build various devices with such construction sets. A person could write his own set of instructions for constructing a new device. The written instructions would be copyrightable, just like a program listing; and if published without copyrighting, they could be freely copied by others. But the device created by following the instructions could very well be patentable either alone or

[22]CBEMA Br. pp. 5, 26-27.

in combination with another device. Kits, similar to such mechanical sets, are also available for creating new electronic circuits and even computers or parts thereof. Clearly, a device constructed with such a set or kit would constitute statutory subject matter under 35 U.S.C. 101, regardless of the copyrightability of the written instructions. A modern general purpose binary digital computer is like a kit in which the coaction of the various elements and subassemblies with each other and with external components are changed by software programming. A patent based upon that new creation would not be a patent on the written instructions.

Patent protection should not be denied to creators of program-related inventions merely because programs may be copyrightable when in written form.

XII.
Conclusion.

For the reasons set forth above, Amicus urges this Court to hold that an invention that is described by means of a mathematical equation or a mathematical algorithm and which may be practiced with the aid of a computer programmed in part by such equation or such mathematical algorithm, constitutes statutory subject matter under 35 U.S.C. 101. Such a holding would be consistent with all of this Court's prior decisions.

Respectfully submitted,

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FOR ARGUMENT

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1977

No. 77-642

LUTRELLE F. PARKER, ACTING COMMISSIONER OF PATENTS AND TRADEMARKS,

Petitioner,

v.

DALE R. FLOOK

Respondent.

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Lutrelle F. Parker Acting Commissioner
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CHANGES IN BRIEF

Page 10, paragraph 6, line 4, the sentence "By the same token, a novel and useful process within the contemplation of 35 U.S.C. 101 can be so created." is not part of the quote and should be incorporated into the main text.

Page 14, line 3, the word "unobvioius" should be "unobvious"; line 7, the word "has" should be "have".

Page 16, in the first full paragraph, line 6, "invalid" should be "valid".

Page 17, first full paragraph, line 2, delete "mathe-".

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Respondent.

BRIEF AMICI CURIAE FOR AMERICAN PATENT LAW ASSOCIATION AND LOS ANGELES PATENT LAW ASSOCIATION

I.

INTEREST OF AMICI

This brief Amicus Curiae is submitted jointly by the American Patent Law Association ("APLA") and the Los Angeles Patent Law Association ("LAPLA") under Rule 42(2) of this Court. The consent of the parties' counsel has been obtained to the filing of this brief and will be separately filed with the Court.

APLA is a nationwide Association of approximately 4,000 members including Judges, Law Teachers, Copyright

and Trademark Lawyers, and approximately half the Patent Lawyers in the country, from private, corporate, and government practice. LAPLA is similarly constituted and has approximately 400 members.

Unlike some specialties of law practice where the plaintiffs and defendants are often represented by predominantly separate legal fraternities, in patent law the same individual attorneys may appear as often on the plaintiff's side as on the defendant's side of patent, trademark and copyright litigation, and on either the licensor's or licensee's side of negotiations for licenses. By such experience and membership composition, these Associations are well balanced in the realities of the patent law in action.

These Associations appear here in an attempt to assist the Court and in an effort to assure orderly development of the patent law. More particularly, the amici Associations appear because they are deeply concerned that Petitioner's brief badly confuses and erroneously intermingles two separate and distinct principles of patent law which are:

(1) the law relating to the *types* of subject matter which may be patented under any circumstances (as prescribed in 35 U.S.C. 101); and

(2) the *requirements* for patentability of subject matter which *is* of the type which may be patented (as prescribed in 35 U.S.C. 102 and 103).

Furthermore, the amici Associations believe that a *single* standard of patentability should apply to patent claims, not, as Petitioner's brief would have it, a different standard of patentability for patent claims containing algorithms as compared with all other types of claims.

II.

THE SOLE ISSUE BEFORE THIS COURT IS WHETHER THE FLOOK CLAIMS RECITE A "PROCESS" WITHIN THE MEANING OF 35 U.S.C. 101, NOT WHETHER THAT PROCESS IS PATENTABLE OVER THE PRIOR ART UNDER 35 U.S.C. 102 OR 103.

The sole issue presented in this case is whether the claims of the patent application filed by respondent Flook recite a "process" within the meaning of 35 U.S.C. 101, which provides that patents may be granted to:

> "Whoever invents or discovers any new and useful process. . . ."

It is of utmost importance to take note of the fact that the record in this case establishes that patentability over the prior art is *not* an issue which has been ripened for decision by this Court because:

(1) the final rejection by the Patent Examiner (App. 25 A-27 A) did not reject the claims as unpatentable over the prior art;

(2) the decision by the Board of Appeals of the Patent and Trademark Office (App. 52 A-55 A) did not reject the claims as unpatentable over the prior art; and

(3) the decision of the Court of Customs and Patent Appeals in this case, *In re Flook*, 559 F.2d 21 (1977), did not reject the claims as unpatentable over the prior art.

Rather, both the Patent Examiner and the Board of Appeals of the Patent and Trademark Office rejected the claims as failing to recite a "process" within the meaning of 35 U.S.C. 101 which could be patented. Both the Patent Examiner and

the Board of Appeals of the Patent and Trademark Office concluded that the claims were drawn not to a process but to an algorithm and that a "patent containing these claims could in effect be a patent on the algorithm itself." (App. 53 A.)

Furthermore, the Patent Examiner conceded (App. 47 A) that the claimed process "is a technologically useful invention." The invention comprises a method for adjusting the "alarm limit" of at least one process variable in a process comprising the catalytic chemical conversion of hydrocarbons. The claimed method is described with adequate specificity at pages 3-5 of Petitioner's brief. For the purposes of deciding the sole issue before this Court, it is believed to be sufficient to note that each of the claims here involved includes the following steps (App. 63 A, 64 A):

(a) "determining the present value of said process variable";

(b) using algorithms to determine an updated alarm limit; and

(c) "adjusting said alarm limit to said updated alarm limit value."

In specific terms, the question which has been brought before this Court is whether the foregoing process steps constitute, as this Court viewed the claims for converting one type of number to another in *Gottschalk v. Benson*, 409 U.S. 63 (1972), an abstract principle which cannot be patented, on the *application* of a principle to a *useful* end, which *Benson* made clear *can* be patented.

III.

SUMMARY OF ARGUMENT

The patent application claims before this Court recite *use* of an algorithm to determine the alarm limit value for a process variable in a hydrocarbon conversion process *and* the *adjusting* of the alarm limit to the updated value so determined. As such, the claims recite a *post-solution* step which takes the use of the algorithm out of the abstract and makes it concrete and tangible, thereby supplying the post-solution activity which was lacking in *Gottschalk v. Benson*, 409 U.S. 63 (1972).

Petitioner's contention that a process which employs a mathematical or scientific principle must be inventive in both conception and implementation, viz., that it must be doubly inventive, is totally at odds with 35 U.S.C. 103 and the leading Supreme Court case on the subject, *Graham v. John Deere Co.*, 383 U.S. 1 (1966).

The claims before this Court are directed to a concrete technological process, not an idea, and are statutorily proper under 35 U.S.C. 101. Petitioner's attempt to transmute this statutorily proper process claim into a non-statutory "idea" claim by focusing only on the algorithm recited is simply an incorrect analysis and is incompatible with this Court's holding in *MacKay Radio & Telegraph Co. v. Radio Corporation of America*, 306 U.S. 86, 94 (1939).

This Court's holding in *Gottschalk v. Benson, supra*, is not only fully consistent with *MacKay* but supports the view that the Flook claims are statutory because they apply a principle to a useful end, a factor that was absent from the *Benson* claims.

Petitioner's brief is directed not to an issue before this Court (whether the claims recite a statutory process) but to an issue not properly before this Court (patentability over the prior art). Given the limited record before this Court on the issue of patentability, if Petitioner has belatedly concluded that patentability over the prior art is an important issue in this case, it should seek remand, not reversal.

Petitioner's contention that an inventor's own conception should be used as prior art against him and, even if the conception is unobvious, the implementation of that conception must *also* be inventive for patentability to exist, represents a serious distortion of the prior holdings of this Court and other courts and involves an improper departure from the standards of patentability prescribed in *Graham*.

IV.

ARGUMENT

A. The Flook claims include a post-solution step which takes the use of the algorithm out of the abstract and makes it concrete and tangible, thereby supplying the post-solution activity lacking in Gottschalk v. Benson.

This is, in effect, the *post-solution* step which takes the use of the algorithm out of the abstract and makes it concrete and tangible, thereby supplying the post-solution activity which was lacking in *Gottschalk v. Benson*, 409 U.S. 63 (1977).

The patent application claims before this Court recite the *use* of an algorithm to determine the alarm limit value for a process variable in a hydrocarbon conversion process *and* the *adjusting* of the alarm limit to the updated value so

determined. As such, the claims recite, in the words of *Cochrane v. Deener*, 94 U.S. 780, 788:

> ". . . a series of acts, performed upon the subject matter to be transformed and reduced to a different state. . . ."

In other words, the adjusting of the alarm limit from its original value to its updated value is an act performed to accomplish the transformation of the alarm limit from an original state to a different state. Accordingly, it is clear that the claims recite a statutory process within the meaning of 35 U.S.C. 101.[1]

Indeed, Petitioner's brief is riddled with concessions that the claims in issue recite a statutory process, e.g., the very commencement of Petitioner's argument (Pet. Br. 9) states that:

> "The only *advance over the prior art* contained in *Respondent's method* is the mathematical algorithm *it utilizes.*" (Emphasis added.)

This is not a statement that the claim is directed to the algorithm itself; rather, it is the first step in the remainder of Petitioner's argument which is, in reality, simply an argument that the algorithm does not patentably distinguish the claimed method from the prior art, *not* that the claimed method is nothing more than an algorithm which could not be patented under 35 U.S.C. 101. In fact, it is because Petitioner has chosen to argue a question not properly before this Court, viz., patentability over the prior art, but has

[1]It should be noted that it is not necessary that the claimed process be of the *Cochrane v. Deener* type for this Court to hold that it is statutory. For contrary to Petitioner's contention (Pet. Br. 12-16), this Court in *Benson* held that to be patentable, statutory processes need not necessarily operate to transform an article to a different state or be tied to the operation of a specific apparatus. 409 U.S. at 71.

couched this argument in terms of whether the process is statutory under Section 101 (rather than making the appropriate patentability analysis prescribed by Sections 102 and 103 and *Graham v. John Deere Co.*, 383 U.S. 1 (1966)) that the amici Associations have a grave concern that serious confusion and potential distortion of the fabric of the patent law could result.

B. Petitioner's contention that a process which employs a mathematic or scientific principle must be inventive in both conception and implementation is totally at odds with 35 U.S.C. 103 and Graham.

In this regard, Petitioner, straying far afield from the question of statutory subject matter under Section 101, devotes considerable attention (Pet. Br. 19-23) to an argument that is in direct conflict with this Court's holding in *Graham*, i.e., Petitioner argues that, in order to be patentable, a process which employs a mathematical or scientific principle must be inventive in its implementation as well as in its conception. That is to say, Petitioner argues that, in order to be patentable, an invention must be doubly inventive such that even if the concept of applying a particular scientific or mathematical principle in a certain process or machine is unobvious, the *manner* in which that concept is *implemented* must *also* be unobvious in order for the process or machine to be patentable. Such a theory is totally at odds with the relevant statutory prescription, 35 U.S.C. 103, and the leading case, *Graham*, which interprets that statute.[2]

[2]We will refer to this point hereafter.

C. The claims are directed to a concrete technological process, not an idea, and are statutorily proper under 35 U.S.C. 101.

As we have pointed out above, the process claims here involved contain a series of steps including the solution of an algorithm and culminating in the *post-solution* step of "adjusting" the alarm limit of the process variable to a new updated value. Thus, it is clear that these claims recite the transformation of the state of the alarm limit from an original state to a new and different state. As such, there can be no doubt that these claims are directed to a "process" as that term is used in 35 U.S.C. 101 and according to the ordinary usage of that term.

Petitioner attempts to transmute this statutorily proper process claim into a non-statutory "idea" focusing only on the algorithm recited in the claim and, in effect, arguing that a claim which recites a statutory process can be rendered non-statutory by adding to that claim the recitation of an algorithm. This is simply an incorrect analysis.

Manifestly, patent claims must be read as a whole and cannot be dissected for the purpose of determining whether they recite statutory subject matter any more than they can be dissected for purposes of determining infringement[3] or patentability over the prior art.

[3]See *Aro Manufacturing Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 345 (1961) where this Court held that there is no legally recognizable *part* of a claim which can be considered the essential element, gist or heart of a patent claim. Rather, a claim must be read as a whole for the purposes of determining infringement and the same approach is the only one which can properly be taken here.

This principle was cogently articulated in *In re Chatfield,* 545 F.2d 251, 158 (C.C.P.A. 1976) where the court said:

> "Our reference in *Christensen* to the mathematical equation as being 'at the point of novelty' *does not equate* to a holding that a claim may be dissected, the claim components searched in the prior art, and, if the *only component* found novel is outside the statutory classes of invention, the claim may be rejected under 35 U.S.C. 101. That procedure is *neither correct nor within the intent of Congress* for the reasons we stated in *Bernhart* (427 F.2d 1365)." (Emphasis added.)

To do otherwise would be to fall into the error pointed out by Mr. Justice Holmes in *Joseph Schlitz Co. v. Houston Ice and Brewing Co.*, 250 U.S. 28 (1919), when he said:

> "It is a fallacy to break the fagot stick by stick."

Were this not the case, this Court's decision in *MacKay Radio & Telegraph Co. v. Radio Corporation of America,* 306 U.S. 86, 94 (1939) would have been drastically different. There, this Court held that claims to a radio antenna which differed from the prior art only by reason of recitation of a mathematical formula which expressed the angle between each wire of the antenna and its bisector was a structure eligible for patentability under the patent laws. In *MacKay*, the Court noted that:

> ". . . (W)hile a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be." 306 U.S. at 94. By the same token, a novel and useful process within the contemplation of 35 U.S.C. 101 can be so created.

Thus, we believe it fair to say that it will be necessary for this Court to overrule *MacKay* if it is to adopt Petitioner's

position in the present case that the process claims here involved do not recite a statutory process.

D. This Court's holding in Gottschalk v. Benson supports the Amici view that the Flook claims are statutory because they apply a principle to a useful end.

The decision in *Gottschalk v. Benson,* 409 U.S. 63 (1972) is in no way inconsistent with *MacKay* or *Chatfield.* The claims before this Court in *Benson* were *not* directed to a process for transforming a concrete device (here, an alarm limit) from an original state to a new state, but rather to a method for converting a certain type of *number,* binary coded decimal numerals, into another kind of number, pure binary numerals. Thus, the claims in *Benson* were directed to a *mathematical* manipulation of precisely the same character as the conversion of fractions to decimals by dividing the numerator of a fraction by its denominator. Plainly, a number conversion, such as that involved in *Benson*, or the conversion of fractions to decimals, is an abstract principle which *Benson* held is not patentable subject matter under 35 U.S.C. 101.

However, it can be of no assistance to this Court to argue, as Petitioner does, that simply because a part of the claims in the present case constitutes a mathematical algorithm, those claims do not constitute statutory subject matter. Such an argument improperly fails to treat the claims as a whole, as required by 35 U.S.C. 103.[4]

[4]Section 103 talks in terms of whether "the subject matter *as a whole* would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." (Emphasis added.)

If anything, the decision in *Benson* supports the view that the claims in the present case do, in fact, recite statutory subject matter because what was found lacking in *Benson*, the *application* of the principle to a *useful end*, is present here.

E. The issue of patentability over the prior art is not properly before this Court.

Read as a whole, it is believed that Petitioner's brief is not, in reality, directed to the issue nominally before this Court (whether the claims recite a statutory process), but is directed to an issue not properly before this Court, namely, patentability over the prior art. The amici Associations express no view on the issue of patentability over the prior art because they believe that that issue cannot be properly decided upon the record in this case and, indeed, has not been developed by the administrative process below. At present, there is really no prior art before the Court, only Petitioner's assertions with regard to bits and pieces of the claimed process which Respondent has allegedly conceded to be in the prior art. However, even if the concessions are as represented, Respondent has had no occasion to, and therefore no opportunity to, put into the record such evidence as might be available to him to demonstrate that his claims are unobvious over the prior art within the meaning of 35 U.S.C. 103 and in the manner prescribed by *Graham v. John Deere Co.*, 383 U.S. 1 (1966). Furthermore, the "Appendix" attached to Petitioner's Brief makes extensive reference to extra-record matters such as the Brown Publication cited in footnote 2 at page 3A. This is tantamount to starting the patent examining process in this Court rather

than seeking remand for further examination by the Patent Examiner in light of this reference.

It is wholly inappropriate for Petitioner to attempt to short-circuit the administrative process by urging this Court to consider patentability over the prior art on the basis of the limited record before it. If Petitioner has belatedly concluded that patentability over the prior art is an important issue in this case, it should seek remand, not reversal.

Petitioner's brief urges upon this Court an erroneous and improper standard of patentability and, because the amici Associations are deeply concerned that the patent law would be seriously distorted if that erroneous standard rather than the standard prescribed by *Graham, supra,* were adopted, we believe a discussion of standards of patentability to be imperative, even though we also believe that patentability over the prior art is not properly before this Court.

F. Petitioner urges an improper departure from the standards of patentability prescribed in Graham.

In *Graham, supra,* this Court held that the standard of patentability (or invention) was constitutional and was to be decided by first determining the scope and content of the prior art, the level of skill in the art and the differences between the prior art and the claimed invention, and then determining whether such differences would have been obvious to one of ordinary skill in the art at the time the invention was made.

In a serious distortion of the prior holdings of this Court and other courts, Petitioner urges (Pet. Br. 19-23) that an entirely different standard of patentability should be used.

According to Petitioner, an inventor's own conception should be used as prior art against him and, even if the conception is unobvioius, it is argued that the implementation of that conception (or "idea") must *also* be "inventive," i.e., unobvious, in order for patentability to exist. Patentability should not be, and has not been, judged by such a four-foot yardstick. The courts and Congress has been consistent in recognition of the fact that the hurdle of inventiveness, i.e., unobviousness, must be cleared only once in order to obtain a patent.

A few examples will suffice. Charles Goodyear's conception or "idea" that rubber could be effectively vulcanized by adding sulphur to a mass of molten rubber is generally recognized as a significant contribution to mankind and was patented. Yet, the *implementation* of that idea amounted to nothing more than adding sulphur to rubber and, plainly, was not separately inventive. Similarly, the conception, or "idea," of Wallace H. Carrothers that certain chemicals could be reacted to produce a useful plastic material (nylon) was implemented by placing those chemicals in a suitable container, e.g., a beaker, and allowing them to react. Given the idea, the implementation was straightforward and not inventive. The same would be true of most chemical reactions. Yet, a patent was granted to Carrothers and hundreds of thousands of other chemical reactions have been patented. Another famous invention, which was found by this Court to be the subject of a valid patent in *Eibel Process Co. v. Paper Co.*, 261 U.S. 45 (1923), and which involved the tilting of a known paper-making machine (the "Fourdrinier"), was clearly unobvious only in conception, not in its implementation.

Still further, 35 U.S.C. 100(b) expressly provides that a new use of a known machine, process or composition is

patentable as a process. Given the conception or "idea" of making such a new use of a known machine, process or composition, Section 100(b) would be meaningless if there was an *additional* requirement that the implementation of the idea also be inventive, i.e., unobvious It is not surprising, therefore, that many patents have been issued for the new use of existing compositions as processes, e.g., methods of treating diseases by administering the composition, which involved a manifestly noninventive implementation, i.e., having the patient ingest the medicine. Thus, several centuries of uniform judicial and administrative precedent have required *only* that the "idea" be inventive, i.e., unobvious in order to be patentable.

It follows that if the idea or discovery is reduced to tangible form, and if it is unobvious, it is a patentable invention and there is absolutely no basis for the assertion that the implementation of the unobvious idea must *also* be unobvious. But the Petitioner urges that an additional requirement that the implementation of the idea also be inventive, i.e., unobvious, will safeguard "the free exchange of abstract intellectual concepts, which are 'the basic tools of scientific and technological work' (*Gottschalk v. Benson*, 409 U.S. 63, 67)" (Pet. Br. 10). It has never been seriously urged, however, that abstract intellectual concepts and disembodied ideas should be preemptable by patent. Indeed, it was the disembodied nature of the claimed mathematical principles in *Benson* that led this Court to conclude that the claims there presented "were not limited to any particular art or technology, to any particular apparatus or machine or to any particular end use." Obviously, claims so disembodied and unlimited could do little else than appear to preempt an underlying algorithm. If Petitioner's proposition is accepted

that it is only the "inventive use" of a new principle that warrants patent protection, then this Court's holding that Eibel's contribution "that surprised and startled the paper-making trade" (261 U.S. 45, 55) was improperly decided because all that Eibel did to implement his discovery was to elevate the "well known and universally used" Fourdrinier machine to some slight angle with the horizontal. Would Petitioner suggest that the grant of the patent to Eibel precluded the "free exchange of abstract intellectual concepts" in Eibel's discovery involving the unobvious application of a physical principle, viz., the force of gravity?

If as Petitioner would have it, an inventor's idea is, in effect, used as prior art against him, the result is a hindsight approach to the issue of patentability which this Court has many times condemned, most recently in *United States v. Adams*, 383 U.S. 39, 50 (1966), where, in the course of determining that a patent directed to a battery was invalid, this Court ruled that it "begs the question" to state that the battery components claimed in combination were known to have been used individually as such components in other batteries. Rather, this Court pointed out that the issue was whether "bringing them together" was patentable. However, given the idea of bringing them together, the implementation of that idea could not be said to be unobvious since it involved nothing more than putting the components together in a conventional manner to construct a battery.

While Petitioner contends that there is language in *Funk Brothers Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127 (1948), which can be read to express a different standard of patentability (Pet. Br. 19-20), such a contention necessarily involves a reading of *Funk* in a manner inconsistent with

Graham, Adams and the 1952 Patent Act.[5] More specifically *Funk* involved product claims directed to a mixture of naturally occurring bacteria. This Court held that such naturally occurring bacteria are, by definition, in the prior art and that packaging them as a mixture could not amount to invention because the mixture was intended to do in concert what the individual bacteria would do separately. This Court further held that the concept, i.e., the choice of mutually non-inhibitive strains of bacteria, was not inventive because it was a "simple step", i.e., obvious, to mix those strains which would not have an adverse effect on each other. This is a far cry from Petitioner's theory, which would apply a different standard of patentability, not in conformance with *Graham's* interpretation of Section 103, requiring unobviousness of implementation even if the concept was unobvious.

Contrary to Petitioner's theory, the standards of *Graham* necessarily apply to inventions involving the use of mathe-mathematical or scientific principles in the same manner as they do to other types of inventions.

V.

CONCLUSION

The law, as it relates to the patentability of claims containing mathematical algorithms, has been developing in a logical and orderly manner since this Court's decision in

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[5] *See also, Blonder-Tongue Laboratories v. University of Illinois Foundation*, 402 U.S. 313, 333 (1971), requiring use of the *Graham* standards.

Gottschalk v. Benson, 409 U.S. 63 (1972). The Court of Customs and Patent Appeals has followed the prescription of *Benson* in refusing to allow claims which recited no post-solution application of the algorithm in *In re Christensen*, 478 F.2d 1392 (C.C.P.A. 1973) because such claims did not recite statutory subject matter, but has, consistent with *MacKay Radio & Telegraph Co. v. Radio Corp. of America*, 306 U.S. 86 (1939) and the discussion of *MacKay* in *Benson*, found that claims which recite post-solution steps which apply the solution in a tangible and concrete manner to comprise statutory subject matter in *In re Chatfield*, 545 F.2d 152 (C.C.P.A. 1976) and in the present case. Thus, we believe that the decision of the court below that the claims here involved recite statutory subject matter should be affirmed.

We also believe that the issue of patentability over the prior art is not properly before this Court and should not be decided upon the record here.

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IN THE

Supreme Court of the United States

October Term, 1977.

No. 77-642.

LUTRELLE F. PARKER, Acting Commissioner of Patents and Trademarks,

Petitioner,

v.

DALE R. FLOOK,

Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

BRIEF AMICUS CURIAE FOR THE ASSOCIATION OF DATA PROCESSING SERVICE ORGANIZATIONS (ADAPSO).

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IN THE

Supreme Court of the United States

OCTOBER TERM, 1977

No. 77-642

LUTRELLE F. PARKER,
ACTING COMMISSIONER OF PATENTS AND TRADEMARKS,
Petitioner,

v.

DALE R. FLOOK,
Respondent.

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF AMICUS CURIAE FOR THE ASSOCIATION OF DATA PROCESSING SERVICE ORGANIZATIONS (ADAPSO)

The Association of Data Processing Service Organizations files this brief amicus curiae in opposition to Petitioner, and also files letters of consent of the parties in accordance with the Rules.

QUESTIONS PRESENTED.

1. Whether the writ of certiorari should be dismissed in a case in which (a) the factual premise for requesting certiorari is mooted, (b) there is a jurisdictional barrier to the consideration of a central issue, (c) the factual record is inadequate and (d) a principal question for which certiorari was requested is improperly presented to the Court?

2. Whether an otherwise patentable automated process becomes unpatentable subject matter solely because a portion of the process is performed by a programmed general-purpose computer?

3. Whether an otherwise patentable process becomes unpatentable subject matter solely because a portion employs a programmed digital computer to perform calculations?

4. Whether software manufacturers have protection of the patent laws equal to that given to hardware manufacturers.

INTEREST OF AMICUS CURIAE.

Association of Data Processing Service Organizations (hereinafter ADAPSO) is a nonprofit trade association of 308 companies in the computer field,[1] approximately 33% of whom concentrate their attention in the software products and services industry and the remainder largely in the furnishing of varied time sharing and data center services.

ADAPSO presents its views to the Court because an inaccurate description of software technology and the software products industry has been set forth by petitioner's brief and the supporting brief of the hardware manufacturers' association, CBEMA.

ADAPSO software product companies are not developers of mathematical algorithms. They are companies engaged in building and manufacturing software machines for which profit-conscious companies will and do expend money. ADAPSO members believe they are entitled to the same patent protection for their innovative products as that granted the hardware manufacturers.

1. The Association has 308 member companies whose annual revenues are broken up as follows:

Revenues	*Number of Members*
$100,000 - $ 1 million	201
$ 1 million - $ 5 million	75
$ 5 million - $10 million	13
$10 million - $50 million	12
$50 million and over	7

Virtually all its member companies develop computer programs and require different forms of protection for these programs, including

1. (Cont'd.)

the availability of patent protection on the same basis currently available to the manufacturers of computer hardware. Generally, member companies belong to at least one of the following three sections of ADAPSO:

a. Software Products and Services Companies Section. Members of this section fall into either one group that offers consulting and customer program services; or another that offers copies of a master program for lease or license on a restricted basis. These copies, along with documentation and support, are referred to as software packages, software products, or program packages.

b. Data Center Section. Members of this section are companies that provide data center computer services to organizations that do not have in-house computers—or that desire specialized outside data processing services.

c. Time-Sharing Section. Members of this section offer remote computer facilities on a national and international basis—usually by providing a terminal and communications lines to their customers.

SUMMARY OF ARGUMENT.

The writ of certiorari should be dismissed as improvidently granted, because the Patent Office objections to the issuance of a patent to Flook are mooted, and because of the inadequate record, the jurisdictional barrier to the consideration of a central factual issue, and the inappropriateness of the principal question for which certiorari was granted. To consider what the Patent Commissioner presents as the key issues in this case would require this Court to undertake a thorough inquiry into the complex technological issues of special-purpose computer construction, but the record does not provide the factual basis which would enable the Court to do so. The Supreme Court is not the appropriate forum for initial fact finding.

The most basic technological issue—the Board of Appeals' finding in a predecessor case that programming a general-purpose computer restructures the computer into a different machine—is not jurisdictionally subject to review because 35 U. S. C. § 141, *et seq.* bind the Commissioner of Patents by Board determinations. Since the Board is the *alter ego* of the Commissioner, his indirect attempt to appeal its finding before this Court is in essence a nonjusticiable intra-agency dispute. Moreover, the C. C. P. A. and the Board have considered the basic technological fact issue, each has special credentials of technological expertise and both have found in favor of the restructuring principle.

The broad question for which *certiorari* was granted —whether innovative machines which can be embodied in computer programs are patentable subject matter—is inappropriate for judicial resolution in this case because patentability only depends on the structural nature of the specific invention, not which of alternative types of construction was employed in a preferred embodiment. The petitioner has conceded that the Court cannot formulate a

rule of general applicability in its decision on this case and that the only other question presented—obviousness under 35 U. S. C. § 103—is jurisdictionally not before the Court.

The petitioner's main legal arguments depend on a mischaracterization of computer program technology. An accurate picture of this technology reveals that a programmed general purpose computer is a different machine than the unprogrammed machine. The designer of software, like any engineer, builds machine structures, not "mathematical algorithms"; he develops machine solutions for machine problems. Computer innovations embodied with stored computer programs are legally entitled to the same patent protection as innovations embodied in wire-connected electronic circuits, for technologically "hardware" and "software" are equivalent.

The *facts* that a programmed computer (what respondent has indicated is one form of his invention) is a machine and the innovative aspect of it is a machine structure cannot be overcome by petitioner's *legal* arguments. A machine or technological process is not a "mathematical algorithm." An innovative machine structure is not the mere embodiment of an abstract idea. Machines and their processes are patentable subject matter and respondent's only argument against software being patentable subject matter is the unsupported statement—appealing perhaps to a layman but universally rejected by the experts—that a program is not a machine but merely an "abstract idea," or a "mathematical algorithm."

Patent protection for software is vital to the health of the data processing industry. In a field dominated by the hardware manufacturers, the growth of the small independent software company has been severely hampered by the bundling practices of the hardware manufacturers which continue to this day in the systems programs area. Only through the availability of protection for their prod-

ucts can the software producers hope to bring competition to an industry that sorely needs it.

The absence of patent protection has forced reliance on trade secrecy and has had the negative effect of deterring disclosure of innovations. The availability of patents, with their public disclosure requirement, would "promote the progress of the useful Arts" in this most sophisticated, pervasive and vital area of technology.

Copyright protection is inadequate and inappropriate to protect innovative machine structures. · Copyright of a particular set of computer language statements does not protect the novel machine structure that is the core of any software invention. The Constitution establishes innovation as the prerequisite for a grant of exclusive rights to machine structures; attempts to protect them via copyright or registration run counter to this principle.

At stake in this case is equal patent treatment for the products of small software companies. The myth perpetuated by the Government and CBEMA—that computer-program embodied inventions are not machine inventions—has been exploded; there is now no justification for the denial of patent protection to software-embodied machines.

ARGUMENT.

I. THE WRIT OF CERTIORARI SHOULD BE DISMISSED.

A. The Issue Before the Court Has Been Erroneously Presented as Involving the Question of Patentable Subject Matter Under Section 101.

1. The Factual Premise Upon Which the Grant of Certiorari Is Based Is Mooted.

The factual premise for certiorari is that the Flook patent application discloses a "novel algorithm" (Pet. 7), that "the sole inventive contribution consists of a mathematical algorithm" (Pet. 2, Question Presented; Pet. 11) and that "[t]he only novelty . . . is in the mathematical formula" (Pet. 19). However, Flook's mathematical formula viewed as an abstract mathematical equation is *not novel;* the same equation appears in the statistical treatise [2] relied on by the Patent Office in its brief (at 3A-8A).

2. Brown, *Smoothing, Forecasting and Prediction of Discrete Time Series* (1963) (hereafter "Brown") at 101.

In the Brown treatise, the formula is:

$$S_t(x) = \alpha x_t + (1\text{-}\alpha)S_{t\text{-}1}(x)$$

Compare:

$$B_1 = (F)PVL + (1.0\text{-}F)B_0$$

which is Flook's mathematical equation but with the order of terms rearranged so that corresponding terms of the two equations are set one above the other for ease of comparison. $S_t(x)$, like B_1, is the accumulated weighted average at any time t of a variable x whose value changes with time; $S_{t\text{-}1}(x)$, like B_0, is the weighted average at a preceding time $t - 1$; α and $(1 - \alpha)$, like F and $(1.0 - F)$, are the weighting factors; and x_t, like PVL, is the present value of the variable. See Pet. f.n. 3, at 4; and Br. Pet. f.n. 3; at 4; 3A, 6A and f.n. 5.

A related statement was made in 1657 by Christiaan Huygens, a great Dutch scientist, who introduced the important concept of

Thus it is clear that respondent has not invented or discovered any new mathematics or mathematical formulas or equations. The Flook mathematical equation has been and remains in the public domain. A patent to the Flook method would therefore *not* "confer dominion over the equations themselves" (Br. Pet. 10),[3] and the Patent Office's Section 101 objections to the issuance of a patent to Flook no longer exist; See *Kimball v. Kimball,* 174 U. S. 158; *Alton v. Alton,* 347 U. S. 610; *Taylor v. McElroy,* 360 U. S. 610. The factual premise for certiorari was unfounded and moot, and the Question Presented by the Patent Office (Br. Pet. 2) which incorporates that erroneous premise is likewise academic.

Particularly noteworthy is the fact that the entire premise of the Government's Petition for Writ of Certiorari, lies in its assertion of the novelty and innovative character of the mathematical equation. Yet the Government clearly sets forth in its brief its knowledge of the Brown treatise where the same mathematical equation appears.[4] The Government seems to disassociate itself

2. (Cont'd.)

"mathematical expectation"; namely, the sum $ap + bq$ or $ap + b(1 - p)$ where p and q are the probabilities of winning a and b, respectively, and $q = 1 - p$. This concept was presented in the first formal treatise on probability based upon the investigations of the principal mathematicians of that day into the mathematics of gambling. See H. Eves, *An Introduction to the History of Mathematics* (1976), at 288-289.

3. A patent claim for a technological structure (be it an apparatus structure or a process structure) based on a mathematical formula *does not preempt that formula.* To the contrary, the claim is limited to the structure with a precise relationship of parts set by that formula, for "the invention [is] a narrow one" (*Mackay Radio & Tel. Co. v. Radio Corp.*, 306 U. S. 86, 94).

4. The Patent Office formulates a complex "generalized . . . expression . . . of the alarm-base function" not at issue in this case and notes that "Brown . . . deriv[es] a similar expression"

from any responsibility for the determination of novelty by stating that this was the conclusion of the Patent Examiner and that it would "not contest that conclusion" (Br. Pet. f. n. 12, at 14). Thereafter, the Government refers frequently to the "innovative mathematical algorithm" (Br. Pet. 23).

The Government's failure to place before the Court this identical Brown formula in the petition and again failing to do so in the brief for the petitioner are not explained and has resulted in a completely inaccurate presentation in the Petition and in petitioner's brief. A wrong impression has been thereby left that the issue before the Court is that of patentable subject matter under 35 U. S. C. Section 101 (namely, the issue of preempting a so-called "novel" mathematical equation) when in fact the sole issue is whether the technological relationships of an automated oil refinery's alarm-setting method defined by an old mathematical equation are new and unobvious under 35 U. S. C. Section 103.

2. A Section 103 Inquiry Is Implicitly Raised for the First Time Before This Court by the Patent Office.

The Court has established in *Graham v. John Deere Co.*, 383 U. S. 1, 10, the type of "inquiry" to be undertaken under Section 103. That inquiry must be "followed realistically" to determine "'patentable novelty'" (*id.* at 9)

4. (Cont'd.)

(Br. Pet. f.n. 5 at 6A). But nowhere does it simply advise the Court that an equation mathematically identical to Flook's is in Brown. Instead, the Patent Office erroneously speaks of "The only inventive contribution is in the mathematical formula" and "respondent's discovery of the mathematical equations." (Br. Pet. 22 and 23).

when the individual elements of an invention may be old, but their relationship in a combination of these elements forming the invention is alleged to be new as here (Pet. 15, at f.n. 21). The emphasis on nonobviousness of Section 103 furnishes "a practical test of patentability" (*Graham, supra*, at 10).

That "practical test" requires consideration of "the subject matter as a whole" and whether

> as a whole [it] would be obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains (35 U. S. C. 103).

Applied to this case, Flook's inventive contributions can be evaluated for "patentable novelty" only by considering "as a whole" the automated oil refining process with the alarm limits set in accordance with an old mathematical equation.

The form of such an "inquiry" on "nonobviousness" is not changed where an old mathematical formula is employed to achieve a new technological structure. See *Mackay Radio, supra*, 306 U. S. 86, 94, where the Court stated the rule:

> While a scientific truth, or the mathematical expression of it, is not patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be.

The test for patentable novelty used by the Court in *Mackay Radio* is similar to that of Section 103, namely "whether it was more than the skill of the art," *id.* at 94, to combine old mathematics and known radio antenna structures to produce a novel radio antenna considered as a whole.

That "practical test" of considering "the subject matter as a whole" (Graham at 10-11) cannot be bypassed for any class of invention. As in *Mackay Radio*, that test must also be applied where mathematical equations are used to build and to define "a novel and useful structure" (at 94) such as the oil refining process achieved by Flook's use of this mathematics (Pet. 15, at f.n. 15).

The Patent Office is asserting that the invention is *obvious* when it argues that the Flook oil refining process is constructed "in conventional ways [and is] entirely predictable" (Br. Pet. 13). However, a Section 103 "inquiry" to determine nonobviousness is required by Congress and approved by this Court in *Graham, supra*, at 10:

> [In Section 103, the] emphasis on nonobviousness is one of *inquiry*, not quality and, as such, comports with the constitutional strictures (emphasis added).

There is only one type of inquiry into "non-obviousness" permitted under the patent statutes, that of Section 103, and the Court in *Graham, supra*, at 11 has spelled out in detail the nature of the procedures to be followed.[5] The Patent Office cannot circumvent that statutory mandate, and dispense with such a Section 103 inquiry under the guise of an examination of patentable subject matter under Section 101.

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5. "Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy. See Note, Subtests of 'Nonobviousness,' 112 U. Pa. L. Rev. 1969 (1964)." (*Graham, supra*, at 11).

The Patent Office acknowledges that a Section 103 inquiry in this case was not before the Board of Appeals, "was not before the court below and is not before this Court." (Br. Pet. f.n. 11 at 14; Pet. f.n. 21 at 15). This Court is not equipped to perform *ab initio* a Section 103 inquiry without a record and without the assistance of the tribunals below. Moreover, it would violate the principle that no matter may be argued at the appellate court level which has not previously been raised before the lower court. That principle has particular applicability in this instance where the C. C. P. A.'s "special competence in complex, technical and important matters." [6] would be indispensable.

The Section 103 inquiry implicitly called for by the Patent Office argument is jurisdictionally barred here. 28 U. S. C. 1256 limits the scope of this Court's appellate review to "cases in the C. C. P. A." The section must be read in light of the jurisdictional limitations of 35 U. S. C. § 141, et seq. Because the "obvious" or "predictable" issue was not, and could not have been, in the C. C. P. A. case it cannot be considered by this Court; see § 144.

A Section 103 inquiry is fundamental to the determination of patentability in this case and requires evaluation of the facts of the prior art mathematics never considered by any of the tribunals below. Therefore, the writ of certiorari should be dismissed, and the case returned to the Patent Office, where the Section 103 inquiry can be conducted based on all of the prior art now known.[7]

6. *Glidden Co. v. Zdanok*, 370 U. S. 530, 560.

7. The applicable Patent Office procedure for reopening prosecution after the return of a case from a court decision is described in the Office's Manual of Patent Examining Procedure, Section 1216.01(4) at p. 220.7.

B. Also Erroneously Presented to the Court Is the Question of Patents for Computer Programs or "Computer Applications."

1. The Record in This Case Is Insufficient to Permit Consideration of the Question Presented by the Government.

This Court is being asked by the Patent Office to rule on important factual issues concerning the technology of oil refineries, the automated control of the oil refinery process, as well as computers and computer programs used in the automation. The record below consisting of the patent application and related technical descriptions satisfies the statutory minimum of a disclosure of the invention which would "enable any person skilled in the art . . . to make and use the same" (35 U. S. C. 112). However, it is entirely barren of the type of technological description and background developed at a district court trial through the adversary process which would enable the judge to make his findings of fact and conclusions of law and which would serve as a record for appellate review. The Patent Office has not tendered to this Court or to the court below the kind of additional technological evidence required to support its position, nor could it seek to introduce any such evidence at this state of the proceeding.[8] Since the record "is insufficient to permit decision of [the] claims," [9] the writ of certiorari should be dismissed, see *Massachusetts v. Painten*, 389 U. S. 560.

Some of the major technical fact issues raised by the legal contentions include

1) What is the oil refinery process considered "as a whole" (Section 103); what are its parts that produce the

8. See 35 U. S. C. § 144, which limits the C. C. P. A. to deciding the appeal "on the evidence produced before the Patent Office."

9. *Johnson v. Massachusetts*, 390 U. S. 511.

"process variables" (patent claim 1) whose values are employed in setting the alarm limits? What is an automated oil refinery and why is an alarm required? How is an alarm setting control integrated into an automated system and how are computers and computer programs structured for this process? How does the oil refinery work without Flook's automated alarm setting, and how does it work with it?

2) Is the programmed computer a "concrete embodiment in a specifically devised apparatus" (Pet. Br. 14)? Does programming a general-purpose digital computer restructure the computer into a new machine with a different structure? The Patent Board of Appeals in *Ex parte Johnston* [10] found that it does,[11] and the C. C. P. A. has consistently and unanimously applied that technological principle from the earliest cases.[12] The petitioner seems to suggest that he opposes the restructuring principle (Br. Pet. 14) but tenders no technological evidence to support such a position. In the absence of a factual record of this technology, it is completely inappropriate for the Patent Office to request a rule that would proscribe "the patenting of computer applications." (Br. Pet. 23) and deprive the software industry of the benefits of the patent system.

3) Are hardware- and software-built embodiments of the same machine technologically equivalent? The Patent Office requests a ruling that a software-built machine-system or process is unpatentable solely because it is built in software (see Pet. Br. f.n. 24, 25, at 24). Such a ruling would be completely at odds with the well-established

10. Reported in *Dann v. Johnston* 74-1033, Petition for Writ of Certiorari, 25A, at 28A.

11. See also *infra* at p. 17 for other findings by the Board.

12. *In re Prater and Wei*, 415 F. 2d 1393 (1969); *In re Bernhart*, 417 F. 2d 1395 (1969).

technological "principle of the equivalence of [software] programming and hardware. This principle [is based on the fact] that a program for a general-purpose machine turns it into a special-purpose machine." [13] The Patent Office offers no evidence to the contrary, nor can it justify the different patent-law treatment that it proposes for software-embodied inventions from that accorded hardware-embodied inventions.

This is the fifth computer programming case [14] that the Patent Office has brought to the Court by way of certiorari. It is also the fifth time that the Patent Office asks for a sweeping ruling against patents for machines and machine processes that are constructed with software technology. As in all the preceding cases, this case is devoid of a technological fact record that would justify such a ruling. The Government has not been able—neither with its own resources nor with those of the CBEMA hardware manufacturers—to supply the Court with such a record of technological facts. There is only one conclusion: there are no such facts.

2. Improperly Presented to the Court Is the Request For a Rule Declaring Machines or Processes Built With Computer Programs to be Unpatentable Subject Matter.

This case was presented to the Court as a vehicle for a ruling that software-built special-purpose computers are unpatentable subject matter. However, this Court cannot issue such a rule of unpatentable subject matter under

13. Prof. Saul Gorn, Final Report No. AD 59 URI, at p. 4, from Univ. of Penna. Moore School of Elec. Eng. to U. S. Army Signal Research & Development Labs, 1959.

14. The others are *Gottschalk v. Benson*, 409 U. S. 63; *Dann v. Johnston*, 425 U. S. 219; *Dann v. Chatfield*, No. 76-1559 cert. dnd. — U. S. —; *Dann v. Noll*, No. 76-1558, cert. dnd., — U. S. —.

§ 101, based on the way a machine is built, without violating the spirit and letter of the patent statute. Whether a particular machine constitutes patentable subject matter depends on the well-established principles of patent law—not whether the machine is built with one form of construction (software) as against another (hardware).

This Court cannot rule that all programmed general-purpose computers are unpatentable any more than it could rule a radio built with vacuum tubes is patentable, but if built with transistors, it is unpatentable. The patent statute is broadly drafted, defining as patentable all machines and technological processes using machines regardless of the technology by which they are built.[15]

Unable to decide the principal issue for which certiorari was sought and granted, this Court should exercise its discretion to decline to review the case and dismiss the writ of certiorari as improvidently granted.[16]

II. Special-Purpose Computers Built by Programming a General-Purpose Computer Form Machines and Machine Processes, Hence Patentable Subject Matter.

A. The Technology of Computers and Computer Programs.

The technological facts of the nature of programmed computers are made clear by (a) the computer experts,

15. The only exception of a particular technological field, that of atomic weapons, is explicitly defined by Congress, 42 U. S. C. § 281(a).

16. The dismissal of certiorari would not leave the C. C. P. A. decision as a final adjudication that respondent's invention is patentable subject matter. The validity of any patent that may issue is always subject to attack in an inter partes proceeding (see Reviser's note to 35 U. S. C. § 144) where a full record could be developed, see *Glidden*, *supra* at 578-79. Moreover, the Patent Office, upon remand, may undertake a Section 103 inquiry based on its having learned in the course of these certtiorari proceedings that the mathematical equation is not new.

(b) the C. C. P. A. findings in other cases, (c) the Patent Office's own findings some years ago, and (d) the Board of Appeals' specific fact finding in the *Johnston Case*.[17] The computer experts explain the facts of the well-known "feature distinguishing the computer from other mechanisms . . . its restructurability. . . . The program restructures the computer."[18] The findings of fact as to this computer technology by the C. C. P. A. in a long line of cases up to the present[19] have held that a general-purpose computer is a "storehouse of parts":

> But once a program has been introduced, the general-purpose digital computer becomes a special-purpose digital computer (i.e., a specific electrical circuit. . . .).[20]

The special-purpose computer "is physically different from the machine without the program" and is patentable as a machine defined as a new combination of elements under 35 U. S. C. § 112.[21] The Patent Office in its Guidelines for Examination of Computer Programs (1966)[22] written in

17. See f.n. 10, *supra*.

18. Professor Ivan Flores, City University of New York "Computer Software," *Science & Technology*, No. 89, May, 1969, pp. 16, 17.

19. *In re Prater and Wei*, 415 F. 2d 1393 (1969); *In re Bernhart*, 417 F. 2d 1395 (1969); *In re Comstock*, 481 F. 2d 905 (1973); *In re Knowlton*, 481 F. 2d 1357 (1973).

20. *In re Prater*, *supra*, f.n. 29.

21. *In re Bernhart*, *supra*, at 1400, Judge Rich in the *Johnston Case*, 502 F. 2d 765, 773 reaffirmed "the validity of this principle [namely] a new program makes an old general purpose digital computer into a new and different machine." There has always been unanimity and no dissent in the court below on "the validity of this principle."

22. 829 O. G. 441, 442, by Order of Commissioner of Patents Brenner, August 9, 1966.

part by members of the Patent Office Board of Appeals,[23] recognized that the stored program converts that "'warehouse' of unrelated parts" of the general-purpose computer into a "special-purpose machine" which may be patented as "a novel and useful machine combination due to the interrelation of parts . . . and the fact that portions of the complete machine take the form of a replaceable program is of no moment."

In the *Johnston Case,* the Patent Board of Appeals found:

> . . . that an unprogrammed, or a differently programmed, general-purpose computer is [not] the same machine as the one that would result from appellant's programming of the same or of a similar computer.[24]

The following discussion of the nature of the computer and stored-program technology is presented in order to assist the Court in understanding that respondent's preferred embodiment of a programmed computer for automating an oil refinery's alarm limit control is a "concrete embodiment in a specially devised apparatus," the Patent Office's contrary and unsupported assertion (Br. Pet. 14) notwithstanding.[25]

23. *See* Commissioner of Patents Brenner, "The Future of Computer Programs in the United States Patent Office," *Law of Software,* 1968, p. B-8.

24. Reported in *Dann v. Johnston,* No. 74-1033, Petition for Writ of Certiorari, 25A, at 28A.

25. Petitioner's attempt to have this Court determine by legal fiat and contrary to the facts, the nature of computers and computer programs brings to mind the declaration of the Court of the Special Inquisition that the sun rotated around the earth in the face of Galileo's evidence of a different structural relation of sun and earth; *see* J. Bronowski, *The Ascent of Man,* (1973) p. 213, *et seq.*

1. Respondent's Programmed Computer for Automating an Oil Refinery Is a Circuit Configuration.

Respondent's preferred embodiment of a programmed computer is constructed as a configuration of electrical components formed in "a specific electrical circuit".[26] This structure of respondent's machine (and of other machines implemented with a general-purpose digital computer and an internally-stored computer program) is illustrated in the accompanying diagram of the hierarchical structure of a special-purpose computer (see p. 20).

In this diagram, each level of the hierarchy,[27] supplies the building blocks out of which the circuits of the next level of the system[28] are built. The bottom level consists of electrical components from which the logic circuits are combined into the more complex building blocks —circuits called the "functional units"[29] of the general-purpose computer's processor.[30] These functional units, in turn, are combined into the special-purpose computer (such as respondent's) which receives input signals (for the values of the oil refinery's "process variables") and pro-

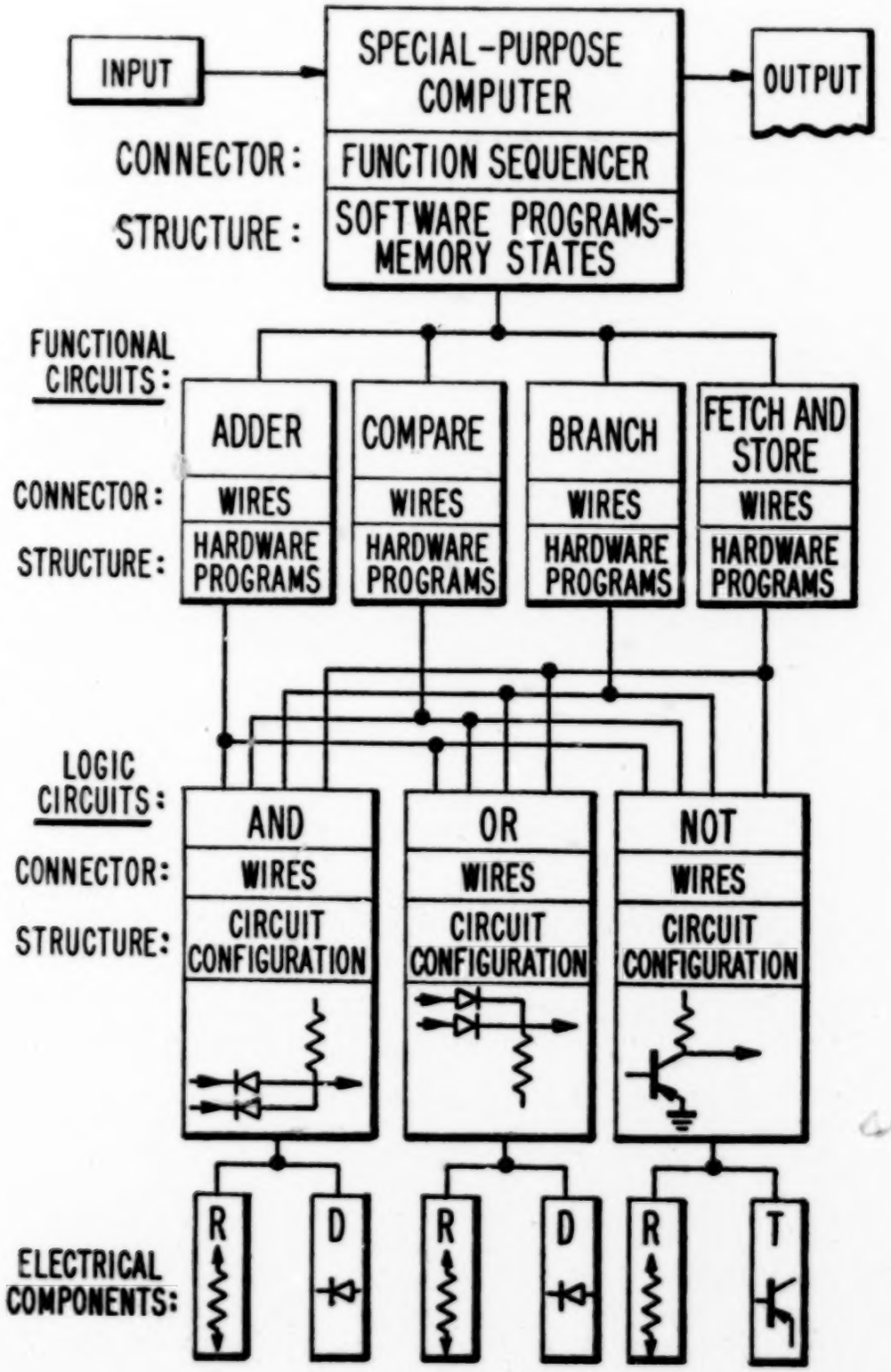
26. *In re Prater, supra,* f.n. 29.

27. "*Hierarchy* . . . a rank arrangement in which the nature of function at each higher level becomes more broadly embracive than at the lower level." (A. Iberall, *Toward a General Science of Viable Systems,* McGraw-Hill, 1972, p. 388.

28. "*System,* A complex unity formed of many, often diverse, parts subject to a common plan or serving a common purpose. . . ." (Ibid. at p. 7).

29. Professor Ivan Flores, *Computer Logic: The Functional Design of Digital Computers,* (W. L. Everitt, Editor) Prentice-Hall, Inc., 1960, Chapter Eleven, "Functional Units," pp. 173-207.

30. And into the other circuits (*e.g.,* memory, sequencer control, input and output) that form the general-purpose computer. "The term *logic* . . . describes the interrelation among the primary building blocks of the computer." Flores, *ibid.,* p. 123.



duces output signals (the updated alarm values used to adjust the refinery's alarm limit).

The electrical components, e.g., resistors (R), diodes (D), transistors (T), at the bottom level [31] of the hierarchy are like those used in all modern electronic equipment (e.g., in radar, television, radio, telephone, automation). These electrical components are combined in different circuit configurations to form logic circuits called AND, OR and NOT which transform electrical signals in a manner representative of their named logic operation.[32]

The logic circuits are structured at the next level into functional circuits (Adder, Compare, Fetch and Store, and Branch or Conditional Transfer of Control). These functional circuits combine electrical signals in accordance with their named function. The Adder functions to add numbers represented by combinations of signals. Similarly, the Compare circuit operates to compare numbers for the relations of "equality" and "greater than" and "less than." Fetch and Store are control circuits for moving data signals to and from the memory, which is constructed from millions of flip-flop circuits, the basic storage units for the binary computer signals.[33]

The Branch or Conditional Transfer of Control performs a function unique to digital computers, whereby the sequence of functional circuits can be varied in accordance with different *conditions* of the input or processed

31. At a still lower level of this structural hierarchy, the molecular and atomic substructure of these components (such as the solid-state transistors and diodes) are important factors in their design and in their interrelationships at higher hierarchical levels.

32. The AND circuit produces an active output signal when all of the circuit's inputs are active; OR, when either one or another, or all of its inputs are active; NOT produces an active output when its input is not active. In place of three different types of logic circuits, many digital computers are built from combinations of a single such circuit, the NOR (the negative of OR; its output is active when neither of its inputs are active).

33. The flip-flop is also formed from the logic circuits.

data. In a simple example, different sequences of circuits are activated depending on which of two numbers are activated.[34]

A general-purpose computer is configured to have a basic "repertoire" of functional circuits (also "instructions" or "orders").[35] The structural configuration of each of these functional, control and memory circuits is called "permanent programming"[36] or "hardware programming."[37]

Programs in the broader sense are part of all automatic machines, and automated systems. "*Program elements* determine *what* the automated system shall do and *how* the parts of the system must function in order to accomplish the desired result."[38]

"Software programming"[39] is the structure of the special-purpose computer which configures the functional circuits (Adder, Compare, Branch, etc.) to interconnect certain sequences of those circuits and combinations of those sequences.[40] The software programming (the internally stored program) takes the physical form of combinations of different states of the memory circuits and of electrical signals that control the states and configurations of the functional circuits.

34. This Branch control (or "Decision") is fundamental to the ability to structure a general-purpose computer into a special-purpose computer by means of software programming.

35. A more elaborate set (*e.g.*, to perform also subtraction, multiplication and division, shifting of numbers, etc.) is often used.

36. I. Flores (1960), *supra*, p. 42.

37. Prof. Saul Rosen, "Hardware Design Reflecting Software Requirements," 33 *Proc. Fall Joint Computer Conference*, 1968, Pt. II, pp. 1443, 1444.

38. "The program may consist of mechanical parts such as gears, cams, and linkages that connect the various portions of a machine together and determine the timing of the various actions of the machine. In the most modern computer-controlled systems, the program may be stored in the form of punched paper cards, paper tape, magnetic tape, ferrite cores, electronic circuits, or other mechanical or electronic "memory" devices. 2 *New Encylopedia Britannica: Macropaedia*, 505, 506, "Automation."

39. Term used herein for what is customarily called "computer programming" to avoid semantic confusion with hardware programming.

40. Basic repetitive sequences are called "sub-routines." (Br. Pet. 15).

Software programming resembles hardware programming in a number of respects, and most importantly in the way that lower-level building blocks are structured.[41] However, the connector used with the software for configuring the functional units is a different type from that of the hardware programming. Starting at the bottom level of the hierarchy, as shown in the diagram, the electrical components are connected together in the logic circuits by fixed wire or "hardwire" connectors.[42] The logic circuits are similarly hardwire connected into the functional circuits and other circuits of the general-purpose computer. However, at the top of the hierarchy, a "softwire" connector is employed for the software structure. This connector includes a function ("instruction") sequencer, which effectively interconnects the functional circuits in the sequences prescribed by the software programming.[43]

By forming the structure at the top of the hierarchy as electrical signals, that structure can be stored in the computer memory in the same way that other signals are

41. The software and hardware programming are engineering equivalents, as discussed hereinafter.

42. "Hardwire" connections may be made by simply twisting or soldering wires together or in more advanced fabrication by printed circuits or integrated circuits; *see Scientific American* article, May, 1975, "Microprocessors."

43. The function sequencer activates by control signals the circuitry of the functional units at the appropriate times in sequences specified by the software programming. When activated the circuits are effectively "connected," and when inactive they are not. The engineer's term "softwire" refers to use of control signals for the connections. The sequencer, memory, input and output circuits are all part of the general-purpose computer; the control program is in the states of the memory circuits.

stored. The ability to store the structure of a special-purpose computer in the form of electrical signals gives rise to the ability to replace one such structure by another simply by replacing one set of electrical signals (software program) by another. *This concept of the stored-program computer is the foundation on which the computer industry is built.*

Since the building blocks of each hierarchical level of such computers are nested within those of the next higher level as shown in the diagram, the special-purpose computer at the top level includes all of the elements and structural relations shown in the drawing. This special-purpose computer receives input signals and, within its circuits, combines them and modifies them to produce output signals. The combining and modifying is in accordance with the structure of the stored software programming, which uniquely establishes the "rule of action" [44] of the special-purpose computer.

Respondent's special-purpose computer, in the same way, functions as "a specific electrical circuit" [45] configured out of sequences of functional circuits, which in turn are configured combinations of logic circuits, which in turn are configured combinations of circuit components.

2. The General-Purpose Computer Is an Incomplete Machine That Serves as "a Storehouse of Parts" and Is Completed by Respondent's Stored Program to Form a New Combination of Circuits as Respondent's Programmed Computer for Automating an Oil Refinery.

The general-purpose computer, though extremely complex, is an inchoate, and *incomplete* machine. The functional circuits (Adder, Compare, Branch, etc.) are

44. Robinson on Patents, Vol. I, p. 257, § 173.
45. *In re Prater, supra.*

not interrelated nor do they co-act in any useful way until structured [46] by the software programming into a special-purpose computer. The functional circuits are building blocks used by the software; and in that respect the general purpose computer is a "'warehouse' of unrelated parts." [47]

This "storehouse of parts" [48] character of the general-purpose computer is evident from the hierarchical diagram on p. 21. Starting at the bottom level, each level serves as a storehouse of parts for the next higher level. The electrical components (resistors, diodes, transistors) serve no purpose by themselves and acquire functions only when connected in the various circuit configurations of the logic circuits. Similarly, the logic circuits serve only as a storehouse of parts for assembling the different circuit configurations of the functional units, and the latter circuits which constitute the general-purpose computer are interconnected by the software programming in the various sequences and combinations that make up the special-purpose computer.

The set of building blocks at each level is similar to the familiar toy Erector Set, whose parts can be connected in an unlimited number of ways to form machines of a wide variety of types. For example, with a storehouse of the electric components (resistors, diodes and transistors, etc.) almost all of the known electrical circuits can be built, including those of the computer logic circuits. With a storehouse of logic circuits, all of the various functional and other circuits of general-purpose computers can be built.[49] Similarly, the function circuits are interconnected

46. *See* Flores, (1969), *supra*, pp. 16, 17.
47. Patent Office Guidelines (1966), *supra.*
48. *In re Prater, supra.*
49. Special-purpose computers are also built directly from the logic circuits using permanent or hardware programming. One could also use the logic circuits as the functional units of the general-purpose computer, namely, the building blocks for software

by the software into an endless variety of automatic machines—a musical synthesizer, the controls of a lunar landing module, a document reader for electric meter reports, a calculator for thereafter calculating and printing the associated electric bills. Respondent's programmed computer is similarly constructed in its preferred form of construction.

There is no predetermined relationship of the function circuits (Adder, Compare, Branch, etc. or their individual functions) to any of the above special-purpose computers and other devices; they are "*unrelated* parts" [50] (emphasis added). Nor is there a predetermined relationship of the resistors, diodes and transistors to a computer or television set. However, when the functional circuits of the general-purpose computer are structured by software programming—such as that of any of the above examples—these circuits are organized and interrelated by that programming just as are the electrical components in a television circuit. In that condition, the function sequencer makes the softwire connections called for by the stored program so that the functional circuits are connected into a special-purpose computer having the structure called for by the program.

The hardwire programming is used in building the functional circuits from the logic circuits and softwire programming is used in inter connecting the functional circuits into a special-purpose computer; both connect building blocks into more complex structures.

In short, as the Government asserted in another case, a software program may be "a technologically innovative

49. (Cont'd.)

programming; but "such an approach would be impractically slow." Goldstine, H. H., *The Computer From Pascal to von Neumann*, (1972), p. 257.

50. Patent Office Guidelines (1966), *supra*.

product" [51] and may be demonstrated to have "technological superiority".[52]

The phrase "patents for computer programs" as used by the Patent Office to describe the key issue in these "computer programming" cases,[53] is technically imprecise and misleading in that what is sought to be protected in this technology is not some abstraction unrelated to a machine, but the structure of a particular special-purpose machine or machine-control process which may be produced by the softwired or programmed general-purpose computer but which also may be hardwired.

3. Hardware and Software Programming are Equivalent and Alternative Approaches for the Construction of Computerized Control Systems and Equally Patentable.

The Patent Office has set up a false dichotomy in the patentability of computerized control systems. Those implemented by hardware programming (*e.g.*, the general-purpose digital computer) are recognized to be machines by petitioner and patents covering such machines and their control processes are granted subject to their meeting the statutory tests of novelty (35 U. S. C. § 102) and unobviousness (35 U. S. C. § 103). However, computers implemented by software programming are generally denied patentability.[54]

51. Government's Pretrial Brief in *United States v. IBM*, 69 Civ. 200, at p. 202.

52. *Ibid.* at p. 29. This Government Brief in the IBM case makes it clear that the software industry is in the business of selling technological products (machines) not "abstract ideas."

53. *Benson, Johnston, Chatfield,* and *Noll* (see f.n. 14, *supra*), the predecessor cases.

54. The Patent Office is not consistent in this respect; many of the Examiners understand the machine structure of software, as shown by the patent for an "Analytic Character Recognition System" implemented by software, U. S. 3,873,972.

Petitioner's distinction between the two alternative forms of computer construction is inconsistent with the well-established technological "principle of the equivalence of [software] programming and hardware. This principle [is based on the fact] that a program for a general-purpose machine turns it into a special-purpose machine." [55]

Petitioner has acknowledged in the previous *Johnston Case* this equivalence of hardware and software, namely, that a special-purpose computer can be built either by hard-wired logic circuitry or by programming a general-purpose computer.[56] The particular means that is used depends upon many business and engineering trade-offs.[57]

55. "The principle becomes more tangible when we compare in detail the logical design of that special-purpose machine with the flow chart of that program." Prof. Saul Gorn, Final Report No. AD 59 URI, at p. 4, from Univ. of Penna. Moore School of Elec. Eng. to U. S. Army Signal Research & Development Labs, 1959.

56. "The particular operations to be performed by a computer are governed by the state and configuration of its electronic circuitry [which] can be fully built into the computer through wires. . . . Alternatively, the computer may be designed so that the state or configuration of its circuitry can readily be changed without rewiring or other visible physical changes . . . by use of different 'programs.'" (See *Dann v. Johnston* No. 74-1033, Brief for the Petitioner at 14-15.)

57. "Perhaps the most important part of the job of computer system design is to determine which functions are best handled by hardware, and which should be provided by software. All of the traditional engineering considerations come into play here. One must consider the added cost of additional hardware measured against possible gains in operating efficiency. One must consider the availability of manpower with the appropriate skills for design and for implementation. One must also consider intangible factors such as the inherent advantages of simplicity and the hidden costs of complexity.

"From the point of view of the computer user it makes no difference which features are incorporated into the hardware and which are programmed in software.

"It is the combined hardware-software system, the 'extended machine' that the user must rely on to provide the power and flexibility and convenience that have been promised with each new generation of computing equipment." S. Rosen (1968), *supra.*

None of the factors concerning the choice of hard-or-softwiring has any relation to inventiveness of the underlying machine. If the circuit states and configuration of a particular special-purpose computer contain the elements of invention, the machine is patentable and the fact that the wiring is "hard" or "soft" is immaterial, for the two types of computer construction are interchangeable.

This equivalence is inherent in the concept of the stored-program computer. The first electronic computer, the ENIAC built about 1945, was "not a stored-program computer. Programs were installed and changed by engineers who changed the wiring among its various components." [58] The stored-program concept, invented while the ENIAC was being built, had as its very purpose the replacement of the hardwire connections by the softwire. The first published description [59] of the stored-program computer clearly explained (p. 1, ¶ 1.2) that the program ("instructions" [60]) was "an integral part of the [computer's] structure."

58. S. Rosen, Purdue University, "Electronic Computers: A Historical Survey," *Computing Surveys*, Vol. 1 (1969), pp. 7, 8.

59. A. W. Burks, H. H. Goldstine, J. von Neumann, *Preliminary Discussion of the Logical Design of an Electronic Computing Instrument*, 1946. In this famous "paper that became a landmark in the history of computer sciences if not in the history of human thought," (4 *New Encyclopedia Britannica: Macropaedia*, 1045, 1047) John von Neumann and his colleagues at the Institute for Advanced Study in Princeton first published "this stored-program concept" on which the modern computer is based and the technology of which underlies the issues in this case.

60. A human receives *instructions* on how to operate the manual choke in an automobile. When an *automatic* choke is built in by means of a "program," we don't think of "instructing" the engine or its controls. Yet that is the terminology of the computer industry established thirty years or more ago to describe the automatic controls of a stored program. The automatic control of the choke in future cars will be done by a more advanced programmed general-purpose computer, and appropriate computer "instructions" will be used for that purpose. *See* Vacroux, *infra*, f.n. 76, at p. 40.

As far back as 1949, when the first stored-program computer was constructed in England, its builders recognized the equivalence of programming by hardwire and softwire, and explained that additional functional circuits could be added to the computer or the equivalent software programming could be used to implement the same functions.[61]

The Patent Office has no difficulty in finding patentable subject matter in the hardware approach to building special-purpose computers which technologically began to be replaced 30 years ago with stored-program inventions. However, it insists that the stored program approach which is the present foundation of the computer industry and is revolutionizing the entire electronics industry is not patentable. To base disparate legal treatment upon a mode of construction has no justification in law, technology or common sense. Softwired (*i.e.*, wireless) programming is an historic advance over the wired program. The patent statutes and their constitutional base were not intended to be limited to a finite period of technological development. There is no justification for the Patent Office's position that technology has now outstripped the boundaries of patent law.

The equivalence of hardware and software underlies this revolutionary change taking place today in the electronics industry. Programmed microcomputers (general-purpose computers constructed with "microscopic components"[62]) are used to build electronic apparatus in "a wide range of applications from specialized laboratory instruments to sales terminals and electronic games."[63]

61. M. V. Wilkes, "Progress in High-Speed Calculating Machine Design," *Nature*, Vol. 164 (1949) pp. 341-3.

62. A. G. Vacroux, "Microcomputers," *supra*, pp. 32, 33.

63. *Ibid.*, p. 34.

"Until recently digital circuits were designed almost exclusively with 'hardwired' logic . . . although this approach is very powerful (indeed, it is used in most of the electronic equipment manufactured today), it yields an *inflexible* product that is difficult to modify or improve without major redesign. Most of the microcomputers in service today were adopted as a replacement for *inflexible* circuitry. . . . *it is to their flexibility, inherent in all stored-program systems, that they owe most of their popularity.*[64]

Thus, the general-purpose computer has become (in miniature size) a tool that is structured by the addition of programs to build all kinds of instruments and apparatus. Each programmed microcomputer is a different electronic machine as is each hardwired device that the programmed microcomputer is replacing. Such electronic machines have unquestionably been patentable subject matter under 35 U. S. C. § 101 when hardware programming was used. The objection to patentability based upon the use of the more modern and "flexible" technology of the stored program cannot be justified by any basis in law or fact.[65]

The denial of patents to a modern technology (the softwire mode of building special-purpose computers and other machines) raises anew the question: whether the

64. *Ibid.*, p. 39.

65. The failure to recognize the equivalence of hardware and software opens a pandora's box and leads inevitably to a "raiding" situation in which existing hardware patents have no legal protection from infringing software-constructed devices. *See Digitronics Corp. v. The New York Racing Association*, (E. D. N. Y.), 187 U. S. P. Q. 602, affd. on other grounds 553 F. 2d 740, cert. dnd., — U. S. —. This problem is not limited to the computer field, for many automatic machines have the potential to employ a programmed general-purpose computer to replace their existing electronic, electrical or mechanical controls. *See* 2 *New Encyclopedia Britannica, "Automation," supra.*

Patent Office "freeze[s] . . . patents to old technologies, leaving no room for the revelations of the new, onrushing technology." (*Benson, supra,* at 71.)

4. Software Is Not an "Abstract Idea" and Its Construction Is Engineering.

The software products segment of the computer industry is composed of hundreds of small and medium size companies, many of which are members of ADAPSO. The programmers build software out of building blocks to engineer the special-purpose computer in its hierarchical structure,[66] much the same as that required for other modern complex machines.

In the hierarchy of computer systems, the logic circuit designer builds logic circuits such as "AND" and "OR" circuits without concern for the molecular structure of the individual transistors and other components that make up those electronic circuits (which concern is left to component designers working at a lower level of hierarchy). The designer of the hardware function circuits such as "ADD," "COMPARE" and "STORE," configures logic circuits without concern for the detailed structure of the individual logic circuits he uses to construct the hardware function circuits. Similarly, the "programmer," the designer of the special-purpose computer, configures hardware function circuits into the structure of the ultimate special-purpose machine without concern for the detailed structure of the individual hardware function circuits. The same hierarchical process is followed if, instead of softwire programming, hardwire programming is used to build the special-purpose computer.

66. See "Hierarchies—Software Engineering Design," Software Engineering, International Computer State of the Art Report, 1972, p. 47 et seq.

These building blocks lie on successive levels of a hierarchy of circuit construction and the software engineering is performed at the highest level. The software itself, because of its complexity, often must also be constructed in a number of hierarchical levels, and the software engineer should preferably work like:

> ". . . the electrical engineer designing a new T.V. set [who] certainly doesn't design each vacuum tube, transistor, and capacitor all over again; he relies on existing components. In fact, he normally designs on a much higher level, using 'off-the-shelf' power supplies, oscillators, etc." [67]

A recent IBM report further demonstrates the similarities in software and hardware engineering:

> Structured programming reduces the arrangement of the program logic to a process like that found in [hardware] engineering where logic circuits are constructed from a basic set of figures. As such, it represents a standard based on a solid theoretical foundation.[68]

Working at different levels in the system hierarchy of the special-purpose computer to be built, contemporary software engineers as that IBM report explains, may use a "structured programming" [69] approach similar to the design of other automatic machines:

> The top-down approach is patterned after the natural approach to system design and requires that

67. The IBM report, "Composite Design: The Design of Modular Programs," Jan. 1973, p. 6.

68. "Management Concepts for Top-Down Structured Programming," IBM Report, February 1973, p. 1.

69. *Ibid.*, Abstract.

programming proceed from developing the control architecture (interface) statements and initial data definitions downward to developing and integrating the functional units.

In the Apollo Space Shuttle Software System, a mammoth software development effort:

> . . . program structuring is of major importance; decisions . . . determine the total structure of the software both statically and dynamically. Program structuring defines the building blocks, the control mechanisms and the interfaces of the software. It is in this effort that the interrelationship of systems software, applications software and data is entirely mapped out.[70]

The software engineer builds complex automatic machines as the foregoing examples amply demonstrate. Neither the software engineer nor the hardware engineer devises "abstract ideas" or "mathematical algorithms," contrary to the Patent Office's suggestions (Br. Pet. 17) and to what CBEMA would have the Court believe (Br. CBEMA 17).

The design and development process in this technology is quite similar to that of any other technology. First the goal is decided upon, then the prior art is explored for possible solutions and, if not found, the "technological roadblocks" are identified.[71] Invention may take place in overcoming these roadblocks.

Parallels to the design and development process of other machines may be seen in the software design process

70. "Top-Down, Bottom-Up, Structured Programming & Program Structure," Draper Labs, MIT, Dec., 1972, pp. 28, 31.

71. *See, e.g., Computers in the 1980's*, R. Turn, Columbia Univ. Press, 1974, p. 21.

presented in a paper at the World NATO Conference entitled "Software Engineering" [72] which took place in Germany in 1969 and was attended by over 50 experts and prominent leaders in the software field.

B. Copyrights Cannot Protect Machine Inventions; Patents, Which Can, are Needed for Software.

CBEMA's suggestions that copyright is a viable method of protecting inventions in programmed computers is contradicted by the constitutional limitation of copyright protection to "writings." Copyrights may only be used to protect particular printed records and descriptions of machines, but not the actual machine structure that they represent. To one whose innovation is a machine structure for a special-purpose computer built with software, only patent protection will suffice.

The copyright laws contain no novelty requirement; exclusive rights are predicated minimally on originality. CBEMA favors copyright protection because its members apparently are not interested in protecting the innovation in software (which may exist in 1% of all programs) but are interested in protecting the non-innovative aspects of software (perhaps 99% of all programs), the part of a machine which has never been protectable.

III. RULE OF BENSON.

The Court, in *Dann v. Johnston*, 425 U. S. 219 (after extensive briefing on the patentability of software-embodied machines, and on the technology of general-purpose computers, computer programs and programmed general

72. "Software Engineering," Report on a World Conference Sponsored by the NATO Science Committee, Garmisch, Germany, Jan., 1969, p. 13.

purpose computers) reaffirmed that the rule in *Gottschalk v. Benson*, 409 U. S. 63, was "a limited holding"; namely:

> "[t]he [Benson] claims were not limited to any particular art or technology, to any particular apparatus or machinery, or to any particular end use." [409 U. S.] at 64. . . . Our limited holding, id., at 71, was that respondent's method was not a patentable "process" as the term is defined in 35 U. S. C. § 100(b).

The Patent Office had sought in *Johnston* to extend the *Benson* rule to deny patentability to machines and machine processes constructed with software programming. But the Court's response was to emphasize the *limited Benson* holding. The Patent Office now seeks to resurrect the matters laid to rest in *Johnston*.

In *Benson*, the absence of claim limitations "to any particular art or technology, to any particular apparatus or machinery, or to any particular end use" made it clear that the claim was for an abstract mathematical process that cannot be preempted by a patent. *Benson* did not find non-patentability because software (rather than hardware) was the mode of construction.

Respondent's invention is directed to an innovation in the automated controls of an oil refinery, and particularly to the setting of the control limits for an alarm needed in the automated oil refinery. Unlike *Benson*, the claims herein are limited to a "particular art and technology . . . and to a particular end use," that of the oil refining process and the adjustment of the refinery's alarm limits. The claims are also limited to "particular apparatus or machinery" involved in the oil refinery process and particularly that of the alarm and its control limits. The only thing that would be patented by these claims is a technological process.

The computer technology deals with a subhuman activity that superficially is associated with the mind.[73] But any patent to respondent's automated oil refinery process controlled in the preferred embodiment by his special-purpose computer would not cover any "abstract idea," because any oil refinery operator is free to practice the mathematics except in the process of setting its alarm limit control. The latter technological process is no more the embodiment of an "abstract idea," than any other part of the oil refinery process.

IV. NATURE OF THE SOFTWARE PRODUCTS INDUSTRY.

A. The Delayed Development of Competition in Software.

ADAPSO is an organization of relatively small companies. CBEMA is an organization of relatively large companies led by IBM [74] in the computer hardware industry but including such giant companies as Sperry-Rand, Honeywell, Burroughs, Control Data and National Cash Register.[75]

Most of the independent software package suppliers (software products manufacturers) are small firms employing fewer than 25 people and having less than $1 million per year in revenues. One half of the suppliers

73. "[I]n the words of James Clerk Maxwell, 'the human mind is seldom satisfied, and is certainly never exercising its highest functions, when it is doing the work of a calculating machine' . . . Just as the use of man's muscles for pumping water was inefficient, so was the use of his mind for carrying out calculations . . . Computing is thus subhuman in that it calls on very few of man's manifold abilities and yet is fundamental to many of his other activities." *Goldstine, supra*, at p. 343.

74. Government's Pretrial Brief, *U. S. v. IBM*, 69 Civ. 200, S. D. N. Y. (hereinafter Pretrial Br.).

75. See Report, Brooks Subcommittee on H. R. 4845, Aug. 17, 1965, 89th Cong. 1st. Sess. (House Rep. No. 802) "Domination of ADP Industry by IBM," p. 11.

have been in the software package business five years or less. Only 11% of the software package suppliers are publicly financed.[76]

CBEMA distorts the history of the computer industry when it asserts that "the computer industry has developed in an atmosphere of free interchange of computer programs. . . ." [77] How "free" the atmosphere has been in the computer industry is best shown by the Government's pretrial brief in *United States of America v. International Business Machines Corporation.*[78]

The Government in its antitrust action against IBM notes the development of the computer industry and finds that in "the earliest days of the development of the computer industry, there was nothing that could be identified as a software industry." [79] This was in part because users

76. Frost & Sullivan Computer Software & Packaged Services Market, Dec. 1977, p. 51.

77. CBEMA Brief 17-19.

78. Pretrial Br. *supra.*

See also Berteau, "IBM and the Structure of the Industry, The Software Monopoly", 21 *Datamation* 111, October, 1975:

> We have seen hardware technology continue to advance at a rapid pace but the systems architecture seems to stay the same. Have you wondered why? The answer is *software.* As long as the structure of system software is fixed, innovation in system architecture is limited. . . .
>
> The most significant reason for this situation probably lies in the history of software building by manufacturers. It's just not in the manufacturers' interest to produce optimum system software. It might result in the manufacturer selling less iron. . . .
>
> The solution to the software building problem brings us to a real issue facing the industry today—monopoly and restraint of trade in software. We have a small but significant competitive market in applications packages. There is very little competition in sorts and compilers, almost no competition in operating systems. And unless the U. S. antitrust lawyers understand the significance of this, we'll have even less competition in the future.

The author is identified by the magazine as "a holder of one of the early software patents."

79. Pretrial Br. 28.

design some of their own software and because the "computer systems manufacturers, following IBM's lead, provided [free] much of the software [that] users required." [80]

It was not until the late 1960's that "the independent software *products* market emerged. As the Government notes, "in light of the fact that IBM provided its customers with their software requirements as part of the IBM 'total systems solution,' independent software product firms had to market their offerings against products for which there was no identifiable price. As a result, only those companies which could offer products not available 'free' from IBM or which could demonstrate the technological superiority of their products in comparison to IBM's had any chance of survival." [81] The result was that the independent software product firms lacked "a realistic opportunity to compete." [82]

The Government has also noted that "IBM internal memoranda . . . reflect that from as early as 1965, IBM was aware of the marketing benefits derived from bundled pricing and the anticompetitive effect it had on software companies." [83] The net effect was that "bundled pricing enabled IBM to exclude competition from independent software vendors." [84] The limited unbundling that began in 1970 when IBM began pricing some of its software has made competition more possible. In 1977, revenues of independent suppliers of software packages rose to $770 million.[85]

80. Pretrial Br. 28.

81. Pretrial Br. 29.

82. Pretrial Br. 29.

83. Pretrial Br. 205.

84. *Ibid.*, 207.

85. Frost & Sullivan Computer Software & Packaged Services Market, Dec. 1977, p. 169.

Software marketing is also maintained by other hardware manufacturers through the use of bundling. A small software company has sued Sperry Rand, charging it with refusing to place a price on its bundled software and thereby making it impossible for the small company to sell its software in competition.[86] Honeywell in bundling its software and hardware asserts that the software is "free." But when the hardware buyer attempts to transfer that software along with the hardware to another company, Honeywell claims that it owns the software and will control who can have possession.[87]

B. The Resulting Poor-Quality Software.

The CBEMA brief also boasts of "The tremendous growth of the computer software industry and the vast number of breakthroughs in the field of programming, which have occurred in the last three decades" (CBEMA Br. 17-19). How different the facts really are in the computer software field is made clear by the testimony of Dr. Ruth M. Davis, former Director of the Center for Computer Services and Technology of the National Bureau of Standards [88] characterizing the present condition of software as "poor-quality software," a condition which she described as the "crucial computer problem" confronting the nation today. Speaking on the "seriousness of the problems besetting both the consumers of computers products and services and the suppliers of these products and services" Dr. Davis stated:

> The crippling problems are lining up in the software rather than in the hardware field. In particular,

86. *Computerworld*, November 20, 1974, p. 45.

87. *Computerworld*, August 6, 1975, p. 1.

88. Testimony given before the Government Activity Subcommittee, House Committee on Government Operations, May 16, 1972.

> they fall under what we call the application-independent problem category . . . these are the software problems which are common to many applications.

This software that is universally used and that strongly affects machine efficiency and that a hardware manufacturer may not always have an incentive to improve are where the "crippling problems" have been. That the condition described by Dr. Davis in 1972 still holds true is seen by her conclusion in 1977:

> "The first 25-year history of software has not been marked with the successes, the advances, or the decreasing costs associated with computer equipment or hardware . . . software is the most unsafe, the least understood, and the most expensive component of total computer system costs.[89] Software development costs are almost 10 per cent of total system costs. . . . The really useful and exciting advances in computing will probably only proceed at the same pace as advances in software engineering. And this will be distressingly so." [90]

A month later Dr. Davis demonstrated her recognition of the innovative nature of software development. At an ADAPSO Management Conference, she stated:

89. Technological developments, especially in the past 15 years, have dramatically reduced the cost of computer circuitry and increased hardware capability. A microprocessor costing about $20 today has the computing power of a large computer that cost $1 million in the 1950's. However, the cost of software has shown the opposite trend; it has risen continuously. The estimated cost of software development, testing and maintenance for the Federal government alone is $4 billion per year while the capital value of government-owned software is about $25 billion.

90. SCIENCE, American Association for the Advancement of Science, Vol. 195, No. 4283, 18 March 1977.

"Software gives us the capability of using computers creatively, flexibly and economically. It is a product that can be designed to benefit users innovatively and uniquely." [91]

Even IBM acknowledges that "the biggest problem facing programming today is the extreme difficulty and cost encountered in creating and maintaining large programming systems." [92] At the National Computer Conference held in 1975, it was admitted by a leading hardware manufacturer that the "software dinosaur" has not "kept pace with the technical needs of the industry." [93] As a result of the software users being at the mercy of the hardware manufacturers, the users were forced to make do with the "free," poor and technically inferior software.[94]

The reason for the undeveloped state of software lies historically in the bundling by CBEMA manufacturers

91. "Customers' Search for Software Substitutes" Keystone Address at ADAPSO's 46th Management Conference "Responding to Change" April 18, 1977.

92. The IBM report from their Poughkeepsie Laboratory—"Composite Design: The Design of Modular Programs" Jan., 1973, p. 3.

93. " 'Software Dinosaur' Slows Growth," Univac Vice President Neil Gorchow, Sperry Rand, *Software Digest*, Vol. 7, No. 20, May 22, 1975, p. 2.

94. "155, 165 Owners Angry With IBM," *Datamation*, August, 1974, p. 76. The "free" software of the hardware manufacturers has been described by a professional for 24 years in electronic data processing (EDP): ". . . Computer systems are in many cases defective. They are primarily defective in the computer programs that come with the hardware—the body of programs referred to as the 'Operating System' . . . a sort of executive in managing the work of the many parts of the computer system, . . . [the] housekeeping chores . . . [A] very big set of programs [that] is often inefficient, overcomplicated and unreliable . . . [t]he outrageous fact remains that the Operating System is often an imperfect and incomplete product which typically contains errors, omissions and inconsistencies. ("EDP—A 20 Year Ripoff," INFOSYSTEMS, 11/74, pp. 26, 27, 29.)

of hardware. History shows that it has been small technological companies and independent inventors which have been responsible for much of the innovation of this age. A recent government report has found that "studies of the sources of invention and innovation have shown that independent inventors and small technologically based companies are responsible for a remarkably high percentage of the important inventions and innovation of this century." [95]

C. The Small Company Potential for Competition.

The small, mostly "young and struggling," companies who "surely possess excellent technical innovative capabilities" and "the principal technical capability . . . to work . . . on our critical computer problems" [96] have been wrongfully denied the incentive of the patent system, which has been assured to the hardware manufacturers for products they sell. The patent incentive is both a form of recognition and a major aid in obtaining the necessary financing without which these companies face the prospect of shriveling and dying. It is no accident that the practices of CBEMA members of marketing by bundling have permitted only a small number of companies in the software products field to achieve a relative degree of success. As the Government states in its pretrial brief "operating systems continue to be part of [hardware manufacturers'] bundled price structure. These continue to be bundled for the marketing leverage they afford [hardware manufacturers'] computer equipment and forestalling the growth of independent software companies." [97]

95. National Bureau of Standards Experimental Technology Inventives Program, Preliminary Program Description, Fiscal Year 1973 Budget Submission, p. 9.

96. Davis, Committee Testimony, p. 15, *supra*.

97. Pretrial Br. 226.

D. The Importance of Patent Incentives.

The need of the incentive of patents for software is as least as great as that of the incentive available for hardware, because: "Today, providing computer software involves greater . . . risk than providing computer . . . hardware. . . ." [98]

To a financial giant, the economic value of a patent may not loom large; to the small software products companies upon which the future of the development of quality software depends, the value of the patent in financing a small company may spell the difference between life and death. To banks and financial institutions the existence of a patent or even the potentiality of obtaining one may well be a decisive factor in determining whether a loan should be granted. To prospective investors a patent or the possibility of obtaining one may be the principal element in the decision whether to invest.

Making clear that patents may be available for inventions in software would unleash important innovative talent. It would have the direct opposite effect forecast by the CBEMA hardware manufacturers; it would enable competition with those companies and provide the needed incentive to stimulate innovation.

Patent protection would encourage the free dissemination of program innovations which is so necessary to stimulate technological progress. Disclosure is the statutory price paid by the inventor for patent protection. Without such protection inventors principally have to rely on the law of trade secrets in order to secure the economic value of their inventions, thereby excluding from the world-at-large disclosure of the invention.

98. COMPUTER SOFTWARE MANAGEMENT. A primer for project management and quality control—Dennis W. Fife. U. S. Dept. of Commerce; NBS Special Publication 500-11, July 1977, p. 1.

When the Patent Office for its own convenience [99] urges that inventors rely on trade secrets in lieu of patents, it is ignoring the mandate of the Patent Laws, and when it urges copyrights as another potential alternative, it is denying the inventiveness of an entire technology, thus abdicating its responsibility under the Patent Laws to grant patents for machines and machine processes, that "advance the Progress of the useful Arts."

Such computer programs as are freely disclosed in the trade literature of the computer industry have little economic value or technological worth. All that this kind of "free exchange" has produced for the computer industry has been "crippling problems" and "poor quality software." The real strides forward in computer development occurred in hardware, an area fully protected by the patent laws. In a competitive economy that which is given away for nothing tends to have the same value. Non-profit companies are non-existent in the computer industry. CBEMA favors its version of "free interchange of programs" because bundling has been one of the major techniques of the hardware manufacturer in retaining for itself the software market for its own hardware. It is profits and not "free interchange of programs" or "innovative software" that CBEMA seeks.

99. In 1966 the Patent Office issued Guidelines which based upon the facts of the technology, provided for the patentability of computer program inventions "Guidelines to Examination of Programs," 829 *Official Gazette*, 441, 442, July 6, 1966. In 1968, the Patent Office issued a set of Revised Guidelines, "Guidelines to Examination of Programs," 855 *Official Gazette*, 829, 830, October 22, 1968, based upon "policy" (*i.e.*, not legal reasons) limiting severely the grant of patents in this area on grounds of administrative convenience, Brenner, *Law of Software, supra*, B-12.

V. EQUAL PROTECTION REQUIRES THAT MANUFACTURERS OF SOFTWARE PRODUCTS BE GIVEN THE SAME PATENT PROTECTION AFFORDED THE HARDWARE MANUFACTURERS.

Petitioner's classification of a softwired special-purpose computer such as respondent's invention as nonpatentable subject matter lacks any rational basis in fact; hence, it violates respondent's equal protection rights under the Fifth Amendment.[100] Respondent may not be denied patent protection for his machine invention solely because it is software-embodied absent some rational basis for the discrimination. Arbitrary economic favoritism is at the heart of the denial of patents to inventors of software-embodied special-purpose computers while granting patents to inventors of hardware-embodied special-purpose computers.[101]

The instant case is strong, because the patent statute is by its terms generally inclusive.[102] This is not a case in

100. While the Fifth Amendment does not contain an explicit Equal Protection clause, Equal Protection standards applicable to the Federal Government have been incorporated into the Due Process clause of the Fifth Amendment. See *Richardson v. Belcher*, 404 U. S. 78, 81 (1971); *Bolling v. Sharpe*, 347 U. S. 497, 499 (1954).

101. Three different comparisons describe the discrimination against software. First, the Commissioner would grant a patent on the hardware embodiment of a particular special-purpose computer but not on the equivalent software embodiment of the very same machine. Second, the Commissioner would grant patents for the innovative machine products of their competitors, the small software companies. Third, while machines as a class are patentable, 35 U. S. C. § 101, the Commissioner has singled out software-embodied machines and control processes and no others are unpatentable. These discriminations are all predicated on a myth of the non-machine—the bald assertion that a machine constructed with software is an "idea" in direct conflict with the rulings of the Court; see *Burr v. Duryee*, 68 U. S. 531.

102. "[W]hoever invents . . . *any* new and useful . . . machine . . . may obtain a patent therefor. . . ." 35 U. S. C. § 101 (emphasis added). The only exception from patentability of a

which great deference need be given a studied intentional congressional act of exclusion since there was none. To the contrary, the patent policy urged by the Government here violates the Small Business Act[103] in that it discriminates against the small businesses which form the heart and core of the software products industry. Such an inconsistent action by the Government should certainly be predicated upon a sound legal basis rather than a Luddite[104] policy of opposing technological advances. No judicial sanction should be given a strained administrative interpretation that runs counter to the clear import of the statute. While an action of the Commissioner that is consistent with an explicit congressional directive is entitled to deference, when he acts on his own discretion and without congressional support, "a very different question is presented." *Boyden v. Comm'r. of Patents*, 441 F. 2d 1041, 1044 (D. C. Cir. 1971).

102. (Cont'd.)
specific machine technology is that of atomic weapons; see 42 U. S. C. § 2181; but Congress otherwise provided for incentive compensation 42 U. S. C. § 2187(b), (3). There Congress made explicit the exception, reinforcing its mandate that all other machine technologies were intended to be patentable subject matter.

103. 15 U. S. C. § 631, provides: "It is the declared policy of the Congress that the Government should aid, counsel, assist, and protect, insofar as is possible, the interests of small-business concerns in order to preserve free competitive enterprise . . . and to maintain and strengthen the over-all economy of the Nation."

104. "We are probably now at about the comparable point in time in the Computer Revolution to that in the Industrial Revolution when the Luddites were vainly smashing equipment." H. H. Goldstine, *supra*, p. 347. For the last decade and more, there have been hysterical arguments raised against the patenting of software-embodied inventions. First Amendment questions raising the spectre of complete computer domination, panicked fears of the undermining of the patent system, concocted theories of machines being "ideas" and of administrative convenience, have been among the many short-lived stratagems put forth to deny recognition to the uncontrovertible advances of software technology. Must we be so fearful of humankind's ability to utilize technology beneficially that it is necessary to stand against further technological advancement by denying its existence and discouraging its forward thrust.

The Commissioner of Patents offers no justification related to the purposes of thet Patent Act for his classification of software inventions as unpatentable. He does not deny that all machines and machine control processes are patentable subject matter. Instead, the petitioner defends the discrimination with the bald mischaracterization of the programmed general-purpose computer as an "idea" and not a new machine, nor a "specifically devised apparatus" (Br. Pet. 14). This strained unrealistic attempt to rule out an entire machine technology from the patent laws cannot withstand scrutiny. While the petitioner's brief disregards the machine nature of programmed general-purpose computers, he has not presented one bit of supporting evidence to any tribunal in this case, or in any of the predecessor "computer programming" cases.

When the Patent Commissioner singles out for exclusion the economically struggling segment of the data processing industry, and has favored the "economic" interests of the "collective forces of major hardware (i.e., computer) manufacturers and their representative associations," [105] judicial protection against unjustified discrimination is especially necessary. That this is so, is made painfully clear by the bundling condition which exists in the computer industry and which the Government admits has proved so harmful to the software products industry and to our national interests (see Nature of the Software Products Industry, *supra* p. 43).

The form of construction of a special-purpose computer—with hardware or software—bears no relationship to the patent law or any other legitimate government interest. The "useful Arts" are promoted equally by hardware and software patents. In fact, the exclusion of software patents has had a severely detrimental effect on the functioning of the patent system. Since hardware and

105. Judge Rich in the *Johnston* case 502 F. 2d 765, 774.

software can be alternative embodiments of the same machine structure, it is necessary to conduct a search of the prior software art to determine whether a particular hardware invention is novel.[106] The lack of software patents means that there have been inadequate search facilities for hardware.[107] The CBEMA hardware manufacturers seek patents for their hardware but they do not advocate patents for software-embodied machines that would become part of the search resources.

Different treatment based on irrelevant distinctions is unconstitutional. In this case, since invention can take place equally in hardware and software (the choice of construction often being a matter merely of "trade-offs") and since the two embodiments are technologically equivalent, both must be treated identically for purposes of the patent law.

106. The 1966 Report of the President's Commission on the Patent System (reprinted in S. Doc. No. 5, 90th Cong., 1st Sess.; p. 21, now long outdated, reflected the inaccurate and one-sided view of the hardware manufacturers that the software state of the art is irrelevant to hardware. It is to be regretted that the President's Commission permitted itself to be used as a vehicle for the dissemination of this technologically unsound point of view. Much of the innovation in hardware was and still is first achieved in software. Software prior art is as essential as the hardware prior art to adequate examination of the novelty of a hardware-implemented invention. Similarly, both are needed for examination of an equivalent software-implemented invention.

107. Delinquent in its duties for many years, the Patent Office finally in 1972 "initiated a pilot program, with the cooperation of the Bureau of Standards, to develop techniques for classification and searching of the computer programming art." (*See* Pet. Br. *Benson*, p. 31). Since no longer is the argument being raised by the Patent Office about inadequate search facilities, one must conclude that the problem has been solved. The tragedy is that so-called "search facilities" were permitted to become a problem at all. Only the hardware manufacturers benefited during the interim period because it meant that the Examiners were being deprived of the proper research facilities to evaluate the so-called "hardware" inventions, thereby seriously undermining the entire credibility of the patent system. Fortunately, the Patent Office has apparently, albeit belatedly, taken corrective action.

The Government's suggestion of alternative modes of protection for software innovations, such as trade secrets or copyrights,[108] are inadequate and inappropriate to the task, and destructive of the constitutional purpose of the patent system as an incentive to machine innovation.[109] There is no evidence of any intent of Congress to relegate software inventors to reliance on other means of protection.

Copyright protects particular expression, not machine structure. There is no requirement of innovation, only originality; therefore, a copyright would not protect the machine configuration that is at the heart of respondent's invention. The fact that a "program" can be represented as a list of computer operations is no more significant than the fact that a radio circuit can be represented in a schematic diagram. An innovative radio circuit would not be protected by a copyright on a drawing and the special-purpose computer that is respondent's invention would not be protected by a copyright on a program listing.

Trade secrecy is not only inadequate, but forced reliance on its violates the patent policy of disclosure which is needed to advance the "useful Arts". To the inventor, it is burdensome and often impossible to assure the complete secrecy that is required to retain the value of the innovation. Beyond this, reliance on this mode of protection has the counterproductive effect, opposed by

108. Here, too, with respect to copyrights, the 1966 President's Commission allowed itself to be used as an instrument to becloud the issue. The recommendations of the 1966 President's Commission seeking to deny patentability to software-implemented inventions were soundly rejected by Congress; see H. R. 5924, proposed, 35 U. S. C. § 106, 90th Cong., 1st Sess. (1967).

109. The "poor-quality software" that presently exists and the need for the incentive of the patent system is described above at pp. 40-45.

public policy, of deterring disclosure of software innovations, hence, inhibiting the progress of the "useful Arts." Neither trade secrecy nor copyright is a substitute for equal treatment under the patent law.

In sum, the petitioner's arbitrary refusal[110] to grant patents for software inventions, in addition to violating the clear command of the statute, is a deprivation of the inventor's equal protection rights. The petitioner offers no rational reasons for excluding from patentable subject matter the software machine technology. Petitioner's only answer to the equal protection dilemma is the bald assertion that the invention does not include "a specifically devised apparatus" (Br. Pet. 14). Without any evidentiary support, contrary to the views of both the Board and the C. C. P. A., and not jurisdictionally before this Court, that assertion cannot justify nor sustain an unconstitutional Patent Office policy of wholly irrational and unequal treatment.

Software is a new technology that is today viewed as the most critical and important element of a computer system. As in any new technology, for it to grow and compete, it needs all the protection due it under the law. ADAPSO asks the Court to treat the software technology equal to the hardware technology—no better—and no worse.

110. In 1968, the then-Commissioner of Patents stated: "The present Office policy of refusing patents in this [computer program] field has acted as a strong deterrent to the filing of applications." (Commissioner Brenner, *supra*, p. B-12) By its action, the Patent Office acted legislatively in opposition to the patent statutes and to the Small Business Act. While the most direct sufferers of this Patent Office policy are the software products companies engaged in innovative machine building, it is a fact that the loss is suffered by the whole nation which is deprived of the knowledge that would be disclosed to it by the award of a patent.

CONCLUSION.

For the reasons stated above, it is respectfully urged that the writ of certiorari be dismissed. In the alternative, if this Court reaches the merits of the case, the decision of the Court of Customs and Patent Appeals on patentable subject matter should be affirmed.

Respectfully submitted,

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FOR ARGUMENT

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IN THE

Supreme Court of the United States

October Term, 1977.

No. 77-642.

LUTRELLE F. PARKER, Acting Commissioner of Patents and Trademarks,

Petitioner,

v.

DALE R. FLOOK,

Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

BRIEF AMICUS CURIAE FOR APPLIED DATA RESEARCH, INC. (ADR).

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IN THE

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OCTOBER TERM, 1977

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ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF AMICUS CURIAE FOR APPLIED DATA RESEARCH, INC. (ADR).

Applied Data Research, Inc. (hereinafter ADR) files this brief *amicus curiae* in opposition to Petitioner, together with letters of consent of the parties in accordance with the Rules of the Court.

QUESTION PRESENTED.

Whether a machine system or process implemented in software [1] is patentable equally with the same machine system or process implemented in hardware.[2]

1. Software, the stored programs used with a general-purpose computer to construct a special-purpose computer.

2. Hardware, the physical equipment or devices forming a general-purpose computer.

For a discussion of relationships of the technologies of hardware and software as they bear on legal issues before the Court, see Jacobs, "Computer Technology (Hardware and Software):

INTEREST OF AMICUS CURIAE.

ADR was incorporated in 1959 and since then has been a small business engaged in the computer field in the marketing of various computer services, proprietary software products and proprietary hardware/software products.[3] ADR presently markets eleven software products and has been awarded two software patents, one of which was the first patent issued for a software product on the market.[4] This first patent was issued to ADR's AUTOFLOW System, which is one of the most successful standardized software products on the market.

ADR also has a line of software/hardware products called STAR. These products monitor telephone lines and are sold as a total machine to large telephone users. ADR developed the software, built display equipment, bought

2. (Cont'd.)
Some Legal Implications for Antitrust, Copyrights and Patents", *Rutgers Journal of Computers and Law*. Vol. 1970, No. 8, p. 50 and "Hardware Design Reflecting Software Requirements," Prof. Saul Rosen, 33 Proc. of the Fall Joint Computer Conference, Dec. 1968, Pt. II, pp. 1443, 1444.

3. ADR has no interest in any patent that may issue on the Flook application.

4. U. S. No. 3,533,086 of Martin A. Goetz, issued October 6, 1970 for "Automatic System for Constructing and Recording Display Charts."

The other ADR patent is U. S. No. 3,380,029 of Martin A. Goetz, issued April 23, 1968 for "Sorting System." The issuance of this patent received considerable publicity as a so-called "first software patent." Actually, this patent was the first one that was *candidly* presented as implemented by software programming. Prior to that, hardware companies had obtained such patents by the stratagem (called Fabian Strategy by the Patent Office Solicitor) of presenting the invention as though implemented by hardware programming, not by software. One example of such a patent is U. S. No. 3,339,182, "Optimum Result Computer" of IBM. The use of this stratagem by the hardware manufacturers and its recognition by the Patent Office and others manifest the common understanding of the engineering equivalence of the software and hardware technologies.

standard mini-computers and with engineers, programmers, draftsmen, and technicians built the STAR systems on a small assembly line.

In January 1978, ADR was granted a patent for its STAR products;[5] software is used in the invention of this patent to build the complete control system of a complex of telephone monitoring operations for the improvement of telephone service that could not otherwise be performed. The software control system of the STAR products is comparable to the use of software controls for the automation of an oil refinery, which is the subject matter of this case.

ADR believes that an adverse decision in this *Flook Case* may undermine ADR's existing software patents.[6]

ADR is a manufacturer of special-purpose computers created by using ADR software with standard general-purpose computers available from hardware manufacturers such as IBM. Due to the nature of the software technology, a small business like ADR can engage in such a manufacturing business and successfully compete in the open market with the giant hardware manufacturers. For example, IBM also markets software products, much of it ostensibly "free," though its principal business is nominally (as a reflection of its hardware pricing strategy) the manufacture of computers based on hardware programming.

The following information reflects ADR's experience in developing and marketing its "software" products: The initial cost to develop a software product ranges between

5. U. S. Patent No. 4,066,843 of David Waks, et al., issued January 3, 1978 for "Telephone Circuit Monitoring System." ADR has recently sold the business of its STAR product line.

6. Software patents are patents on special-purpose machine systems that, because of technological and economic reasons, are constructed by means of stored programs (*i.e.*, software) and a general-purpose computer.

$50,000 and $500,000.[7] The annual cost to service, maintain and enhance each product is about equal to the development costs.[8] It usually takes 1 to 2 years to develop a product to the point where it is marketable. At least 1 year on the market is required before the number of sales for a particular product reaches a satisfactory level in terms of profitability. Software products are expected to remain marketable for at least 5 years, and must be continually improved to stay competitive during that period. Certain software products, however, may be useful for as many as 10 years or more. The obsolescence factor is more dependent upon the life-span of the class of hardware with which a software product operates than on the functioning of the software program itself. In summary, large investments must be made prior to marketing a software product, and continuing investments are required throughout its marketable life-span.[9]

Petitioner and the supporting hardware manufacturers and their association, CBEMA, oppose patents for software implemented inventions on the grounds that software is an "idea," merely a "method of doing business," or a "mathematical algorithm" as though software had a certain ephemeral character, a nonphysical or "non-

7. As an average, about $200,000 per product is usually invested.

8. ADR has invested almost $2 million in the development and maintenance of AUTOFLOW.

9. See Goetz, "What's Inside the Software Industry," *Computer Decisions*, July, 1975, p. 18: "The business of developing and marketing software products is at least as complex as the business of selling computer hardware, and so requires considerable financial and human resources. There are several marketing considerations that clearly reflect the true nature of software products. These include the need for continued investment in a product even after its release, an effective marketing and pricing strategy for each product, and substantial technical support."

machine"[10] character. Software is a machine[11] and not ephemeral nor a "method of doing business," nor an "idea," nor a "mathematical algorithm."

No one case or group of cases can give the Court a picture of the range of complexity of the software technology and the extraordinary variety of machines that have been built and the far larger variety that remain yet to be built. The complexities and intricacies of the software are comparable to those of the general-purpose computer (the hardware) which is an extremely complex machine.

SUMMARY OF ARGUMENT.

The products of competitive hardware and software companies and their opposing economic interests demonstrate that the issues underlying this case are related to the real world of machines and not to "ideas," nor to "mathematical algorithms."

The technological facts reveal that "software patents" are patents for automatic data processing machines and computer machine systems—not patents for "methods of doing business," "mental processes," or "mathematical algorithms." An examination of several examples of innovative software demonstrates the machine nature of the product. Software and hardware are engineering equivalents and any particular program, such as ADR's AUTOFLOW, could alternatively be built in hardware. Hardware machines that "talk" or "read" or "diagnose"

10. See Jacobs, "Patentable Machines—Systems Embodiable in Hardware or Software (The myth of the Non-Machine)," *Proc. Law of Software*, 1968, p.. B-77. Geo. Wash. Univ. Natl. Law Center.

11. As recognized by IBM, ". . . in some respects computer programs and hardware are interchangeable; hence one can say that a new computer program is similar to a new machine." Galbi, "Proposal for New Legislation to Protect Computer Programming," 17 *Bull. Copyright Soc'y.*, 280, 281.

problems in telephone systems are not business methods or mental processes; clearly the same is true of software-built machines which perform these same tasks.

The proposals of IBM and the other hardware manufacturers for copyright or other forms of protection of software would reverse the constitutional policy of providing an incentive for innovation in these "useful Arts."

ARGUMENT.

1. The economics of the computer industry, as well as the opposing economic interests of the competing companies in the computer industry, demonstrate that the real issues involved in this case are machines and machine systems, and not "mathematical algorithms."

The software side, or sub-industry, of the computer industry is itself a multibillion dollar business whose software directs the operation of stored-program general-purpose hardware. Without software programming, the general-purpose hardware is useless [12], but with software, an "extended machine" is produced. Thus, it is the availability of software that has permitted the computer industry to develop. The argument of the hardware manufacturers (CBEMA) about the "free" exchange of programs and "mathematical algorithms" seeks to perpetuate a myth of the "non-machine." These legal arguments stand in strong contrast to their advertised claims for superior machine construction and operation due to the software.[13]

12. To one who sought some criteria for determining the value of such general-purpose hardware without any software, the suggestion was made to call in a junkman, who would ask simply, "What does it weigh?"

13. See Hewlett-Packard advertisement—*Business Week* March 6, 1978, p. 18, "Protecting the Biggest Investment of All—Programming—that's where you really spend money. We know that from

ADR's experience in the computer industry shows the need for software patent protection. Although it is almost impossible for a small software company to compete successfully against IBM's "free" software products, ADR has done so with its AUTOFLOW product for which it has a patent. ADR's software product AUTOFLOW is directed to an automatic system for developing flowcharts of software programming without human intervention. The system that ADR competed with when it placed AUTOFLOW on the market in 1965 was one offered "free" by IBM to its customers. The IBM FLOWCHART [14] system for the IBM/360 hardware was not an automatic system, since the programmer was himself compelled to sketch manually a rough-draft flow diagram of the software programming that he wished to chart. With records of this rough draft of the flowchart, the IBM FLOWCHART software was used to control the hardware to operate in the

13. (Cont'd.)
experience, too, we spent hundreds of man years developing the operating software for the HP 3000."

See Burroughs advertisement in 227 *Scientific American* 2, July 1972, in which Burroughs sells its machines (hardware and software) with the claims of "More powerful and productive computer systems" that offer *inter alia*, "A comprehensive library of program products for major savings in program development time and related costs" and of "A more powerful and productive master control program" that "increases throughput 10 to 20% . . . [and] confirms Burroughs leadership in control program technology." See also the news article, "Burroughs' Wide Ride With Computer," *Business Week*, July 1, 1972, pp. 54-58.

An IBM announcement (in the *Wall Street Journal*, August 3, 1972, pp. 43, 49) of its new machine technology also stresses the machine character of the software in offering its product for sale: "System 370 virtual storage is created by circuitry and advanced programming that link slower but far less costly peripheral disk storage to main storage in the computer." Certainly, it is not an "idea" that, together with circuitry, does the linking of the disk storage to the main storage.

14. See *IBM Technical Newsletter*, "System/360 FLOWCHART," No. N20-0069-0, Sept. 12, 1966.

nature of a drafting machine to draw a finished flowchart. Unlike the IBM "free" software, ADR's AUTOFLOW is fully automatic, the programmer does not have to draw the layout of the flowchart because the machine "plans" it automatically, and thereafter automatically draws the flowchart.

In marketing its AUTOFLOW product, ADR found the potential IBM/360 market totally saturated with IBM's flowcharting program. ADR initially experienced considerable resistance on the part of IBM computer users against paying for a flowcharting program when they got one "free" from IBM, albeit the flowcharting was not automatic. ADR was compelled to invest heavily in educating the market as to the difference between the semi-manual system of IBM and the fully automatic system of ADR, even though IBM's semi-manual flowcharting was not competitive, neither technically nor in the final flowchart that was achieved. ADR was ultimately successful in the marketing of its product, in one of the first and few instances of such successful competition with IBM's "free" software.

Without reasonable prospects of obtaining a patent, ADR would have been confronted with the situation that IBM could use the concepts of the AUTOFLOW system (for which a patent was finally granted) and develop a system similar to AUTOFLOW and give it away "free." Were that to have happened, ADR's AUTOFLOW business would have been destroyed. ADR has sold or leased more than 1900 units of its AUTOFLOW software product, with gross sales of about 15 million dollars.

The hardware manufacturers have never contested ADR's AUTOFLOW patent by infringing it. Certainly, their arguments before this Court about "methods of doing business," "algorithms" and "ideas" would have no credibility in a defense of an infringement suit, for the issues

would be clear that both ADR and the infringer were both engaged in the sale of automatic machines.

The hardware manufacturers such as the members of *amicus* CBEMA supporting Petitioner have obtained patents for their hardware programming developments; these are the products they price in the bundle of hardware and software that they sell. However, the hardware manufacturers do not wish to be restrained in any way by software patents that companies such as ADR may obtain; for such patents would enable small software companies, as in the case of AUTOFLOW, to enter into competition with the hardware manufacturers even as against the "free" software.

Thus, the software business, in every respect, is concerned with the sale and use of automatic machines and not with "methods of doing business" or "ideas" or "mathematical algorithms."

2. The Facts of the Technology and the Findings of Fact of the C. C. P. A. in Its Predecessor Cases Are That a Programmed Digital Computer Is a Special-Purpose Computer or Machine That Performs Machine Functions, Not a "Mathematical Algorithm".

The C. C. P. A. findings of fact in prior cases [15] apply to the present case. They are: 1) that general-purpose hardware is structured by software into a special-purpose computer, and the structure of this special-purpose machine is different from that of the general-purpose machine and is determined by the inserted software; and 2) that hardware and software forms of programming are engineering equivalents. Once the facts are recognized, the

15. *In re Prater*, 415 F. 2d 1393 (1969); *In re Bernhart*, 417 F. 2d 1395 (1969); *In re Mahoney*, 421 F. 2d 742 (1970); *In re Musgrave*, 431 F. 2d 882 (1970); *In re Foster*, 438 F. 2d 1011 (1971).

patentability of the special-purpose machine follows directly from the statutory provision that machines are patentable subject matter. The briefs of Petitioner and CBEMA, the association of the hardware manufacturers, do not deny these findings of fact, but by predicating their attack against the patentability of software programming on "ideas," "laws of nature," or "mathematical algorithms" the hardware manufacturers are indirectly attacking these findings and are, in effect, seeking their reversal by this Court.

The published statements of industry experts of all kinds over the past 10 years [16] demonstrate that software is a formal technology for constructing machine systems. Additional evidence can be found in the formal education process that now takes place in universities. Degrees in computer science are now offered at the bachelor, master and doctorate levels through engineering departments of a large number of universities. Such degrees

16. Software Engineering Conferences, Reports and Articles:
a. First National Conference on Software Engineering—Sept. 11-12, 1975, Washington, D. C.
b. IEEE International Conference on Software Reliability—April 1975.
c. Composite Design; The Design of Modular Programs, IBM, Poughkeepsie Labs, January 1973.
d. Management Concepts for Top-Down Structured Programming. IBM Technical Report—February 1973.
e. Revolution in Programming; Structured Programming; Structured Programming: Top-Down Approach; Chief Programmer Teams—*Datamation* Magazine, Dec. 1973, 50-61.
f. Top-Down, Bottom-up Structured Programming and Program Structuring.—A Report on the Apollo Space Shuttle Software—MIT, Charles Draper Labs, Dec. 1972.
g. Software Engineering. A collection of software engineering articles by industry and university leaders, INFOTECH; State-of-the-Art Series, 1972.
h. The Software Engineering NATO World Conference—October 7-11, 1968 Germany.

cover, for the most part, the computer engineering disciplines and techniques of building software systems.

From ADR's practical experience with software, it is truly a machine system. ADR personnel are highly experienced and highly educated; they build software machines using a formal method of design that produces a machine architecture of components and functions that interact to form a machine system. The design is generally developed by a chief programmer and a small team of highly skilled programmers who literally build the software system. Such systems whether simple or complex have a machine architecture, which in no way resembles a "method of doing business", an "idea" or "mathematical formula," or a "mathematical algorithm."

Examples of Machine Systems Implemented By Software

The following examples of a variety of automated machine systems implemented by software (those of ADR's two software patents and its pending patent application and two others) contradict the assertions that software inventions are "ideas" or "mathematical algorithms."

A. *AUTOFLOW Flowcharting System.* One unique feature of the software technology is the capability of making "decisions," which has led to the mistaken impression that computers "think." This "decision" feature reveals that a special-purpose computer built by a stored computer program is not (except in a trivial sense) merely a sequence of hardware circuits (or "instructions"). In practice, the program structures many interrelated sequences of those circuits. It is not at all like the player piano that invariably plays the same sequence of chords directed by the holes in the piano roll. The "decision" [17]

17. The term "decision" is a rather pretentious one to describe a machine control operation or "selection" which controls processing

capability enables the program to jump from one sequence to another and back again depending on the results of the processing of the data at different stages. Thus the sequences of operations vary with the nature of the data being processed.[18]

The ability to perform "decisions" by means of a computer program controlling a general-purpose computer is an underlying feature that makes possible the building of so many different types of machines by software. This "decision" feature does not exist in any way in the player piano, which has a fixed, invariable mode of operation built into its mechanisms. If the piano roll has any analogy to the computer, it corresponds to the data supplied to a programmed computer, but even this analogy is superficial at best, for the player piano reproduces without modification the exact sequence of notes specified by the sequence of holes in the piano roll. However, the data in a programmed computer is processed and the sequence of processing varies under the control of the "decision" circuitry as directed by the software. Thus, a player piano is nothing but a piano while a general-purpose computer is converted to a special-purpose machine by software, with the structure of that machine being conveyed by the software.

The alternative paths of data processing resemble a maze with an almost infinite number of alternative

17. (Cont'd.)
to follow one of a number of alternative paths of operation. The criteria for selection are the intermediate results of data processing. The technical jargon in the computer field, which is often quite anthropomorphic in suggesting human characteristics where none exists draws upon the only available terminology that we have, and uses existing words with special machine meanings. The hardware manufacturers' arguments about "ideas" are largely and speciously based on this anthropomorphic terminology.

18. See Jacobs, fn. 2, *supra*, for a discussion of an equivalent hardware technique corresponding to the software "decisions" for producing alternative paths of processing.

choices. For example, if there are 50 specific decision points, the number of possible paths is 2^{50} or over a thousand trillion choices (and more than 50 decision points are common within computer programs). The control of data as it passes through the logical maze is not a function of the hardware circuits, but rather a function of the particular software that directs the hardware.

The hardware circuits are so elementary and universal in their functions that it is only in their combinations in intricate sequences determined by the software that the features of the special-purpose computer are uniquely established. This is the same characteristic found in the building of any machine out of a combination of structural elements. As the computer (or television) circuits are built out of combinations of transistors, resistors and capacitors, so a special-purpose computer is built out of combinations of the general-purpose computer's functional circuits.

These multidirectional mazes of alternative paths of processing are charted automatically by the AUTOFLOW system.[19] It cannot "think" and therefore does not know if it is flowcharting a sorter program, a program for analyzing printed characters (*e.g.*, to read and sort mail in a post office), a program for synthesizing voice (so that the blind can receive communications from a computer), or any of

19. The similarity of this maze of "decisions" in a program to hardware logic gates is shown in a paper by E. B. Daly "Management of software development," IEEE Transactions on Software Engineering, IEEE Computer Society, May 1977, pp. 230-242:

> "*Software development is slower.* Hardware logic gates, as measures of complexity, are comparable to branching [decisions] statements in programs, he says. Comparing hardware development projects to software development projects of about the same complexity, he found that it took about twice as many man-hours to develop one instruction as it did to develop one logic gate. Further, it took *four* times as many man-hours to do design maintenance (corrective maintenance) for software as it did for hardware."

a large variety of other programs that a computer center may have (for directing its single set of hardware). The data processing paths of AUTOFLOW are themselves configured in a complex multidirectional maze.

The AUTOFLOW patent,[20] therefore, is directed to a special-purpose computer which in no sense is a "mathematical algorithm." The United States Government, one of the most enthusiastic customers of AUTOFLOW, has encouraged its use because it is not like a manual or mental process: ". . . manually drawn flowcharts often reflect what the programmer intended to have the program do rather than what he coded it to do. By the use of AUTOFLOW, computerized flowcharts are produced which precisely describe what the programmer has coded."[21] Thus, AUTOFLOW is a unique machine system which is constructed with software programming and the general-purpose computer hardware with which it cooperates in a synergistic way to overcome the hardware's limitations and achieve the desired flowcharting in a useful form by practical means. This machine system is clearly not a "mathematical algorithm."[22]

B. *ADR's Sorter Patent.* A second ADR patent[23] is concerned with the most common form of automatic data processing in the commercial field, that of sorting data (*i.e.*, placing data records in numerical or alphabetical sequence). ADR's sorting patent defines a machine in which the sorting is performed on strings of records which

20. See fn. 4, *supra.*

21. Goddard News, Public Information Office of the Goddard Space Flight Center, NASA, Dec. 12, 1966, pp. 3, 7.

22. At ADR, in the development of software products, the special mathematical skills of mathematicians are not used.

23. See fn. 4, *supra.*

are recorded on magnetic tapes which can be "read" or "played back" only when moving in the forward direction.

The machine sorts strings of records on successive tapes then merges the sorted strings of records and stores the merged records on a tape. The next set of records is similarly sorted and merged, and so on until the tapes all have merged strings of records, whereupon they are merged and stored on one tape. This alternation between sorting and merging is repeated until all of the records are sorted.

This sort-merge construction solves a machine problem of achieving efficient operation where the magnetic tapes can be read while moving in one direction only, and the rewinding of tapes occurs during time periods when its records are not needed for sorting or merging. For that reason it is clear that the software achieves a unique machine construction, and is not an "idea" or "method of doing business" or other non-machine.

Sorting data by a "mental process" would never be done in the way ADR's sorting machine does it. The entire purpose of the patented system is to perform operations at high speed, at millionths and thousandths of a second, and to manipulate the tapes in a certain way to overcome the unique limitations of being readable in one direction only. This machine system is clearly neither mathematics, nor a "mathematical algorithm."

C. *The STAR System.* ADR has developed a machine for detecting, reporting and identifying failures and malfunctions that occur in a telephone network of a large number of telephone lines. This system requires, in addition to special circuitry that connects to the telephone lines, a complex control system for automatically monitoring and "interpreting" the progressive changes in state from the initiation of each call on each line to the failure of the call due to a fault or to normal completion or interruption.

This control system is constructed by a stored program and general-purpose computer, and its complexity stems from its ability to simultaneously follow the signals on a large number of telephone lines. The software-controlled machine directs the circuitry to determine which telephone line to monitor at what *millisecond* in time, and provides the type of overall supervision and control that would be associated with an automated factory. The STAR System performs the routine, tedious tasks that might otherwise have to be performed by a large number of people, but which could not be performed as effectively by them, and reduces the amount of circuitry that must be used. The STAR System operates in an entirely different way from that used by humans to monitor operating conditions on telephone lines, ensures complete privacy of those talking on the lines, and because of its great complexity, it could not be practically achieved in the present state of the art with a construction using all hardware programming. It is clearly not a mathematical process, nor a "mathematical algorithm."

D. *Recognition of Printed Characters.* Machine systems have been developed for automatic reading of printed documents. The machines consist of: 1) an input device which produces electrical signals corresponding to the patterns of black and white print that form a printed symbol (*e.g.*, an optical sensor); 2) an analyzer for processing the signals to identify the symbol; and 3) an output device (*e.g.*, a printer or a control device).

The character recognition analyzer may take a wide variety of forms, independent of the types of input and output devices, and it may be embodied either in software or hardware or some combination of software and hardware, depending on various engineering considerations. Generally, hardware is faster, but it suffers from the disadvantages of requiring a larger investment to tool up for mass production, and it may be too expensive for more complex systems.

The software approach for the character recognition analyzer is more flexible and permits a company to build a machine and to test it out before finalizing the hardware design. In addition, the company can place the machine on the market in the software form for commercial use, and be able readily to modify, enhance and debug it as field use develops. As this technology developed and became more complex, the machine analysis, at least initially, was implemented by software.

The hardware and software forms of a character recognition analyzer are engineering equivalents. The machine structure of a particular analyzer would be generally the same whichever form of programming, hardware or software, were used, so from the standpoint of patent protection, it should make no difference which engineering form is chosen. Hardware manufacturers such as IBM have for many years obtained patents for their character recognition analyzers, which they market in hardware form. A small company should be able to obtain a patent for an innovative character recognition analyzer which initially is embodied in software form, and which subsequently, by that small company or by a hardware manufacturer, may be embodied in hardware form.

In no way is a machine system for recognizing letters and numbers a "mental process," or a "mathematical algorithm." Whether the analyzer is hardware- or software-embodied, a patent would certainly not cover the human process of reading, nor any business method, but only a machine structure.

E. *Voice Assembly.* Digital computer techniques have been developed for assembling speech from prerecorded syllables in which parts of words are stored in

a computer memory, and a special-purpose computer is used to assemble complete words and transmit them to a human operator (*e.g.* in a bank, in response to an inquiry about a depositor's bank balance, or a blind man's request for data from a computer data bank). Such a special-purpose computer may be implemented by software combined with a general-purpose computer, or by hardware programming, or by an appropriate combination of the two. The particular form of embodiment, hardware or software, would not affect the machine system or its functions. In neither case would the patent cover mathematics or a "mental process" (that is, a human process for the assembly of speech) or a "mathematical algorithm."

Summary. In each of these examples of machines (an automatic flowcharter, a sorter, a telephone monitoring system, character recognition equipment, voice assembly equipment) the hardware used may be the same (*e.g.*, the general-purpose computer of any of the hardware manufacturers). The hardware is uniquely structured by the software of these widely different machines as required, without rewiring the hardware and without otherwise changing the hardware or its basic operations. In each of these cases, it is clear, not only is there a machine system distinctly different from a human "mental process," but any patents on these systems would not cover mathematics or prevent the human performance of any "mathematical algorithm." This is especially clear in the ADR AUTOFLOW and Sorter patents, where the inventions are defined in the claims as machines, rather than machine processes,[24] and in the STAR patent where both machine and process claims were granted.

24. In accord with the engineering equivalence of software and hardware, is the C. C. P. A. holding in the *Prater* and *Bernhart* cases, *supra*, note 8, that it is appropriate to define the invention

3. AUTOFLOW is a Machine System That Could Be Converted Into a Handwired Hand-held Machine But for Economic Reasons.

In 1965, ADR conceived of the AUTOFLOW "two-dimensional system for constructing and recording display charts" and in 1970 received a patent on this software machine system.[25]

With the advent of microcomputers and integrated circuits, it is possible to build an AUTOFLOW machine system, completely in hardware, based on the principles covered in the patent. Each of the functions, or groups of functions, could be put into one or more "chips" and the entire machine logic would be the size of today's calculator and would form a "black box."[26] Input/output units in the form of small tape reels (as found in hand-held tape recorders) would be appended to this "black box." In today's technology, the entire machine could be put into a 6" x 12" x 2" or smaller surface and held in one's hand. The price of such a unit might be inordinately high, however. The unit price must reflect the fact that integrated circuits are expensive to design and produce. Generally, a minimum volume of 50,000 units would have to be produced before the cost of development could be recovered.[27]

24. (Cont'd.)
as a machine in patent claims using the statutory claim form specified in 35 U. S. C. 112. The 1966 Patent Office Guidelines to the Examination of Computer Programs, 829 O. G. 1, 2, Aug. 2, 1966, also acknowledge the suitability of defining software as a machine device in this fashion. This procedure was followed by ADR in its patents for AUTOFLOW and the Sorting System.

25. Patent No. 3,533,086, fn. 4, *supra*.

26. A "black box" is a term used for a machine (in a casing or box) when the user does not care and is not concerned about the "internal logic" of the machine. The user is only concerned with the function the machine or "box" performs.

27. *Scientific American*, May, 1975, "Microcomputers," 32, 39.
"These specially made integrated circuits can be justified only when they are produced in volumes large enough (50,000 units, say) to amortize their development costs."

There are reasons other than "volume minimums" to reflect on before business decisions would be made for building a hardware version. AUTOFLOW logic changes to reflect new kinds of input and to incorporate improvements in the output, based on the experience of users. Software, although long-lived,[28] is "volatile," (*i.e.*, easily changed). However, had the software been put into hardware, it would have obsoleted the system at a much quicker pace, which is a common experience with automatic machines of the rigidly fixed type such as hardware.

In conclusion, AUTOFLOW as a machine could theoretically be composed of hardware only and not require the use of a general-purpose computer for "the functioning of the machine." Depending on the economics and other trade-offs between hardware and software, much of today's software might well be put in hardware, since it is possible to convert all software-constructed machines into hardware machines for they are both formed of *interacting circuits.* The interaction or "dynamic interrelationship" (to use the Government's term)[29] among the circuits of the general-purpose computer that is produced by the software is the structure of the software-constructed machine. The same structure is produced by the "dynamic interrelationship" between the circuits of the hardware-constructed machine. The difference between the two machines is that the "dynamic interrelationship" is achieved by electrical signals in software and by fixed wire connections in hardware. As the

28. AUTOFLOW, a product of the mid-1960's is still viable. IBM's operating system, which is built as an "extended machine" of the IBM hardware, and much of today's software originated over 10 years ago.

29. "We acknowledge the dynamic interrelationship between general purpose digital computers and the software programs." (Pet. Br. 36 in *Dann v. Johnston*, No. 74-1033).

latter is patentable, so is the equivalent software; for one who builds machines with software is also working in the "useful Arts."

4. The Proposals of IBM and the Other Hardware Manufacturers for Copyright or Other Forms of Protection of Software Would Reverse the Constitutional Policy of an Incentive to Innovation in the "Useful Arts."

IBM and the other hardware manufacturers represented by CBEMA have fully appreciated the technological equivalence of hardware and software and have built their hardware and software on that technological principle.[30] However, they propose that the patent system continue to be used for legal protection of their hardware systems, but not for the equivalent software. Instead of patents, they propose that some registration system (copyright or other forms) be used for the software type of machine.

The hardware manufacturers would turn upside down the constitutional policy underlying the patent system. The grant of patents for a machine is limited to the *innovation* in that machine, as the Court has unequivocally stated (*Graham v. Deere*, 383 U. S. 1, 6):

> The Congress in the exercise of the patent power may not overreach the restraints imposed by the stated constitutional purpose. Nor may it enlarge the patent monopoly without regard to the innovation, advancement or social benefit gained thereby. Moreover, Congress may not authorize the issuance of patents whose effects are to remove existent knowledge from the public domain, or to restrict free access to materials already available. Innovation, advancement, and things which add to the sum of

30. See fn. 11, *supra*.

> useful knowledge are inherent requisites in a patent system which by constitutional command must "promote the Progress of * * * useful Arts." This is the *standard* expressed in the Constitution and it may not be ignored.

A registration system (whether copyright or otherwise) is intended to protect noninnovative features of the machine system embodied in the detailed coded instructions of the software. Such protection is clearly proscribed by the Constitution. Furthermore, that proposal would have the constitutionally innovative features pass into the public domain. Therefore, the constitutional policy of providing an incentive to "innovation," would not be served by the CBEMA proposals; it would be circumvented.

ADR views itself as an innovative company and wishes to compete on the basis of the improvements that it brings to the software arts. It believes the patent system will supply an incentive for making sorely needed advances to this software technology as it has to others, including that of the equivalent hardware.

The hardware manufacturers, which have substantial monopoly positions in the software that they supply with their hardware,[31] seek a registration system for protection of the non-innovative features of their software and would deny to innovative competitors the incentive that is the basic rationale of the patent system.

Besides stimulating innovation, patent protection will enable other small software companies to compete with

31. See Judge Rich's opinion in *Application of Johnston*, 502 F. 2d 765, 774, revd. on other grounds *sub nom. Dann v. Johnston*, 425 U. S. 219, which notes that the "major hardware . . . manufacturers and their representative associations . . . for economic reasons, [do] not want patents granted *on programs* for their machines." (Emphasis in the original).

the hardware giants, as it did *amicus* ADR. It will end the reliance on trade secrets as the only means to protect innovative software, which has had the effect of inhibiting the free flow of information.

The Patent Office and the hardware manufacturers were unable to persuade the Congress in 1968 to legislate exclusion of computer program inventions from patent protection, and Congress found unpersuasive the Report of the President's Commission on Patents on this issue.

CONCLUSION.

The findings of fact and conclusions of law of the court below are soundly based, and its decision should be affirmed.

Respectfully submitted,

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